

Original instructions



AVANTI SERVICE LIFT

User's, Installation and Maintenance Manual

Model Service Lift PEGASUS



CERTIFICATE

EC Type Examination

EC Directive 2006/42/EC, Article 12, Paragraph 3b Machinery

Certificate Registration No.: 01/205/0823/13 A

Certification body for machinery NB 0035
of TÜV Rheinland Industrie Service GmbH
hereby certifies the company

AVANTI WIND SYSTEMS, S.L.

Pol. Ind. Centrovía – c/ Los Ángeles, nº88
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Conformity of the product

Vertical Platform Service Lift Inside Wind Turbine Systems

Type: PEGASUS-250 kg

Technical data:

Ident. No: 20LP0001
Type of drive: Electric / Pinion-Rack
Max. Lifting height: 150 m
Max. load capacity: 250 kg / 2 People
Max. Lifting speed: 0,33 m/s

with the requirements defined in Annex I to Directive 2006/42/EC on machinery and amending Directive 95/16/EC of the European Parliament and the Council in May 2006 on the approximation of laws, regulations and administrative Member States relating to machinery.

Proof has been furnished on the basis of an EC Type Examination, Report No.: AE.COL.00022-12 from 01.04.2012, and is valid subject to compliance with the requirements stated in this document.

This certificate is valid until 17.09.2018



Berlin, 17.09.2013

Certification body
Notified under No. 0035
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Genau. Richtig.

Date of publication:

2nd CE Edition: 06/2013

Revision 1: 14/06/13

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1. Limited Warranty

Avanti Wind Systems A/S warrants that commencing from the date of shipment to the Customer and continuing for a period of the longer of 365 days thereafter, or the period set forth in the standard AVANTI warranty, the Product¹⁾ described in this Manual will be free from defects in material and workmanship under normal use and service when installed and operated in accordance with the provisions of this Manual.

This warranty is made only to the original user of the Product. The sole and exclusive remedy and the entire liability of Avanti under this limited warranty, shall be, at the option of Avanti, a replacement of the Product (including incidental and freight charges paid by the Customer) with a similar new or reconditioned Product of equivalent value, or a refund of the purchase price if the Product is returned to Avanti, freight and insurance prepaid. The obligations of Avanti are expressly conditioned upon return of the Product in strict accordance with the return procedures of Avanti.

This warranty does not apply if the Product (i) has been altered without the authorization of Avanti or its authorized representative; (ii) has not been installed, operated, repaired, or maintained in accordance with this Manual or other instructions from Avanti; (iii) has been subjected to abuse, neglect, casualty, or negligence; (iv) has been furnished by Avanti to Customer without charge; or (v) has been sold on an "AS-IS" basis.

Except as specifically set forth in this Limited Warranty,

ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, SATISFACTORY QUALITY, COURSE OF DEALING, LAW, USAGE OR TRADE PRACTICE ARE HEREBY EXCLUDED TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW AND ARE EXPRESSLY DISCLAIMED BY AVANTI. IF, PURSUANT TO ANY APPLICABLE LAW, TO THE EXTENT AN IMPLIED WARRANTY CANNOT BE EXCLUDED AS PROVIDED IN THIS LIMITED WARRANTY, ANY IMPLIED WARRANTY IS LIMITED IN TIME TO THE SAME DURATION AS THE EXPRESS WARRANTY PERIOD SET FORTH ABOVE. BECAUSE SOME STATES DO NOT PERMIT LIMITATIONS ON THE DURATION OF IMPLIED WARRANTIES, THIS MAY NOT APPLY TO A GIVEN CUSTOMER. THIS LIMITED WARRANTY GIVES CUSTOMER SPECIFIC LEGAL RIGHTS, AND CUSTOMER MAY HAVE OTHER LEGAL RIGHTS UNDER APPLICABLE LAWS.

This disclaimer shall apply even if the express warranty fails of its essential purpose.

In any cases of dispute the English original shall be taken as authoritative.

* Avanti service lift ("Product")

2. Introduction

2.1 Observations

Only trained people may use this lift.

This manual must be available to staff at all times during installation, maintenance and operation.

Additional copies are available from the manufacturer upon request.

All measurements are indicative only and subject to change without notice.



The pictures and sketches in this manual may not reflect the product aesthetics, colours, arrangement precisely. This has no impact on the function or safety.

2.2 Symbols

Symbol	Signal word	Meaning	Possible injury if not observed
--------	-------------	---------	---------------------------------

Safety instructions



DANGER!

IMMEDIATE or possibly imminent danger:

Death or severe injury!



DANGER!

IMMEDIATE or possibly imminent danger of hazardous voltage:

Death or severe injury!



CAUTION!

Potentially hazardous situation:

Light injury or material damage.

Additional instructions



ATTENTION!

Potentially dangerous situation:

Damage to equipment or workplace



IMPORTANT!

Useful tips for optimum working procedure

None

Order



Reference to written specification/documentation

2.3 Cautions

Use and daily inspection of the service lift shall only be performed by AVANTI or personnel authorised by AVANTI, hired by the employer for the job at hand. Installation and maintenance of the service lift shall only be performed by AVANTI or qualified personnel authorised by AVANTI, hired by the employer for the job at hand. Additionally, these tasks may be performed by qualified personnel authorised by a trainer authorised by AVANTI.

The personnel must be at least 18 years of age. The staff must be familiar with the relevant accident prevention instructions and must have received proper training in these.

Personnel are obliged to read and understand this User's Manual.

Personnel shall wear PPE (safety helmet, full body harness, shock absorber, lanyard and slider) at all times.

A copy of the User's Manual must be handed out to the personnel and must always be available for reference.

If more than one person is entrusted with one of the above tasks, the employer shall appoint a supervisor in charge of the operation.

Self-locking nuts must be used at all times. The screw must extend from the nut by at least half of the thread diameter. The nut may not be used once it has become possible to loosen by hand!

If any damage or faults are found during operation, or if circumstances arise which may jeopardize safety: immediately interrupt the work in progress and notify the supervisor or employer!

All tests/repairs of electrical installations may only be performed by AVANTI or qualified personnel authorised by AVANTI.

All repairs to the traction, braking and supporting systems may only be performed by AVANTI or qualified personnel authorised by AVANTI.

If any supporting parts are repaired or replaced, the operational safety of the system must be tested and verified by AVANTI or qualified personnel authorised by AVANTI.

Only original fault-free parts may be used. Use of non-original parts will render the AVANTI's

warranty void and any type approval invalid. No modification, extension or reconstruction of the service lift is allowed without the AVANTI's prior written consent.

No warranty is provided against damage resulting from reconstruction or modification of equipment or use of non-original parts which are not approved by AVANTI.

Before using the lift perform an inspection by AVANTI or qualified personnel authorised by AVANTI.

Service lift must be inspected at least once a year by AVANTI or qualified personnel authorised by AVANTI. In case of high operating frequency or severe conditions of use, more frequent inspection is required.

Service lift is designed for a lifetime of 20 years with an operating frequency of approximately 12.5 h/year (250 h in total).

Service lift may not be used by persons who are under the influence of alcohol or drugs which may jeopardize working safety.

Service lift shall ONLY be used when the turbine is not generating power.

All wind farm site specific rules must be followed. Service lift shall not be used during inclement weather, including wind speeds over 18 m/s.



Avoid injury – follow all instructions!



The tower owner must verify the need for third party service lift inspections with the local authority and comply with the standards specified.

3. Description

3.1 Purpose

The service lift purpose is to transport persons plus their tools and equipment to the most convenient height for performing work in wind turbine generators (WTG).

Its use is limited to authorised personnel by AVANTI holding the relevant training certificates.

The access to the WTG and consequently to the service lift is controlled and forbidden to public access.

The service lift is used primarily to transport technicians, their tools and spare parts from the bottom platform (or lowest accessible point) to the top platform (or highest accessible point).

It is also used to access intermediate platforms where inspection and service of WTG connecting bolts and other equipment is made.

3.2 Scope

The system consists of a rack and pinion service lift guided along a metal ladder and the necessary accessories allowing the connection to the tower and providing the control and safety functions described in the manual. The accessories include: mast supports (ties to the tower brackets), rest platforms, mechanical stops, safe zone plates, control stations and other electrical equipment. It also includes the hardware necessary to make the connections, labels and warning signs.

The mast sections, their supports and related accessories may be assembled to the tower in the tower factory and supplied later on site for final installation. The cabin is supplied pre-assembled and may be supplied to the tower factory or on site directly. Final assembly, adjustment, installation and verification of the service lift shall be made on site.

The installation of the service lift shall only be made by AVANTI or by a company trained and authorised by AVANTI.

The system, as defined on this scope, is part of machinery falling under Annex IV, section 17 of the European Machinery directive and meets the essential health and safety requirements. A declaration of conformity of the complete system integrated in the wind tower can only be issued after the system has been fully incorporated.

In case the necessary information for the evaluation is not supplied to AVANTI, a declaration of incorporation shall be issued. The wind tower manufacturer is responsible for ensuring full compliance of the system once integrated in the tower in such case. To do so, the instructions and requirements stated in this manual shall be observed.

3.3 Exclusions

The service lift must not be used outdoor or in potentially explosive atmospheres.

The equipment listed below is specifically out of the scope and is needed for the safe integration and use of the service lift.

- Fences to protect users from falling through the service lift hole at platforms. They shall at least comply with EN 14122-3, have non-slip rails or steps facilitating access to the lift at platforms and have no doors.
- Interlock systems for platform fence doors or hatches (when existing) preventing any movement of the lift if the door or hatch are not closed and locked.
- Emergency lighting along the tower and user portable light / helmet light as cabin uses perforated sheet to allow tower light inside.



Tower manufacturer's risk assessment shall include a service lift integration study.

3.4 Technical specifications

Service lift		
Cabin type	Bucket type, front fence (1.1 m) with double door	
Service lift speed	19.4 m/min \pm 10 % (50 Hz)	
	17.4 m/min \pm 10 % (60 Hz)	
Working load limit / N° persons (max)	Less than 250 Kg / 2 Persons	
Travelling height	150 m	
Operating temperature	Standard	-15°C to +60°C
	Low temperature	-25°C to +40°C
Survival temperature	-30°C to +80°C	
Traction system type	Rack and pinion	
Max. noise level	80 dB (A)	
Power supply	3 kW, 16 A	
	3 Phase 400V, 50Hz / 60Hz	
IP protection	min. IP 54	
Control voltage	24 VAC	

Note: for special working conditions, check with the manufacturer

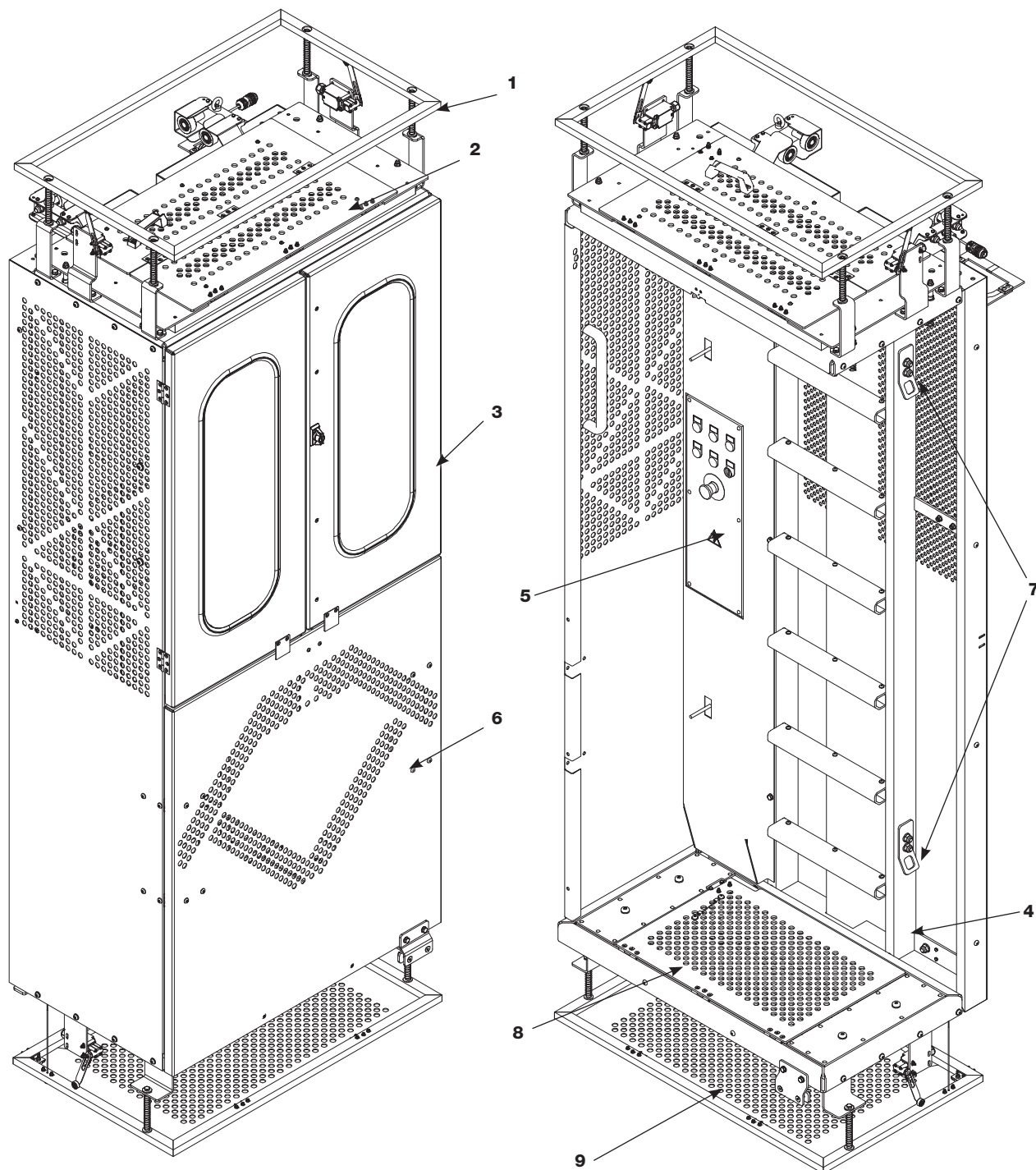
Traction system	
Power	2 x 1.5 kW
Gear box ratio	1 : 15 (50 Hz)
	1 : 20 (60 Hz)
Rack / Pinion module	6
Centrifugal brake limiting speed	24 m/min
Dimensions	220 x 225 x 580 mm
Weight by motor group	30 Kg
Motor speed	1400 rpm (50 Hz) – 1680 rpm (60 Hz)
Nominal current	2 x 3 A
Start current	2 x 15 A

Cabin	
Cabin weight	225 Kg
Outer dimensions (W x D x H)	992 x 717 x 2844 mm
Inner dimensions (W x D x H)	976 x 481 x 2232 mm
Door opening (full) (W x H)	920 x 1100 mm
Top hatch dimensions (W x D)	640 x 400 mm
Bottom hatch dimensions (W x D)	600 x 400 mm

Power & Control cable		
Type	Bottom platform to junction box	18 G 2.5
	Top platform to junction box	8 G 1.5
	Travelling cable	1 x 8 G 2.5 + 1 x 10 G 1.5
Travelling cable weight (approx.)		0.6 Kg/m

Ladder rack (Mast)	
Dimensions	530 x 30 x 1489 mm / 530 x 30 x 2978 mm
Weight (per piece)	15 Kg / 30 Kg
Attachment distance	1 per mast section, max. 3000 mm

3.5 Service lift overview

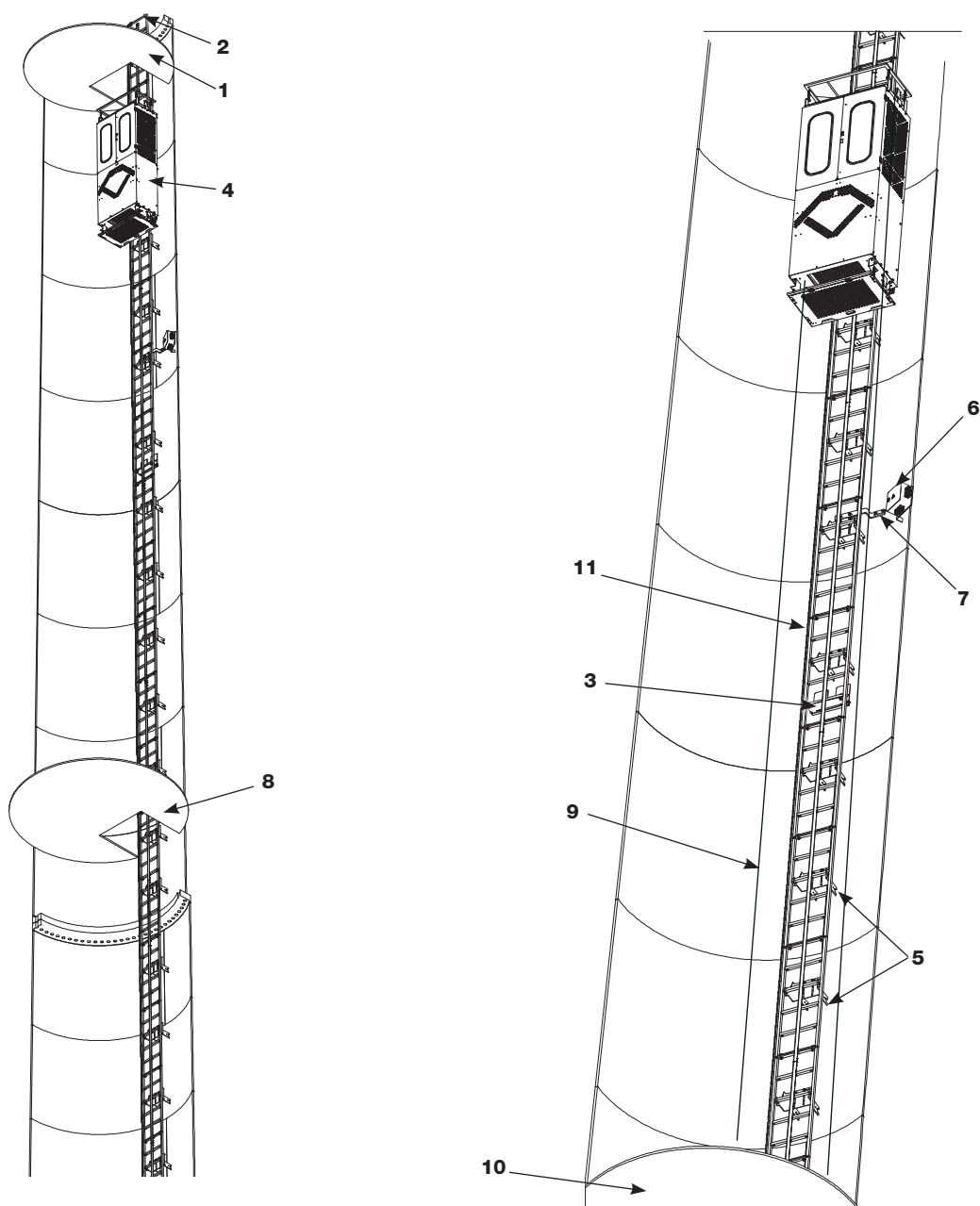


- 1. Top safety stop
- 2. Top hatch
- 3. Double door
- 4. Main frame
- 5. User control box

- 6. Fixed front
- 7. Anchor point for PPE
- 8. Bottom hatch
- 9. Bottom safety stop

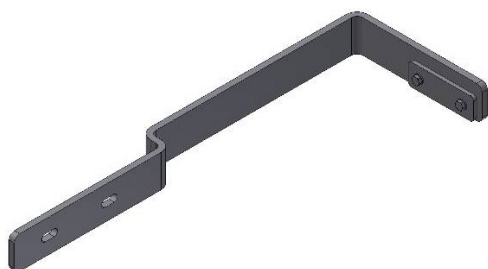
¹⁾Note: Optional feature.

3.6 General arrangement of Pegasus lift inside a generic wind turbine tower



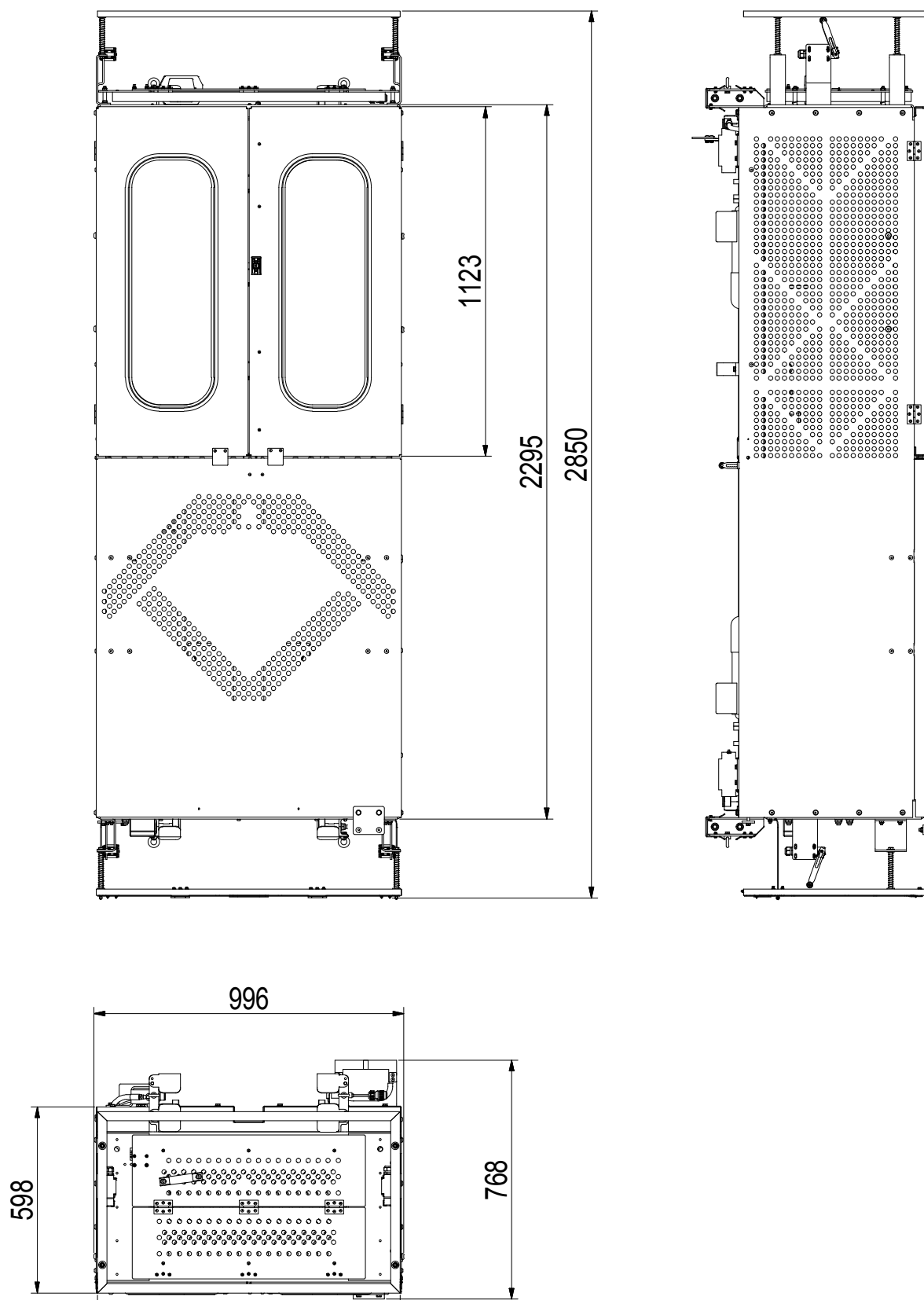
INTERMEDIATE ARM FOR ELECTRIC CABLE

This bracket is screwed to one of the anchorages of the installation at a suitable height to allow the proper reeving of the electrical cable.



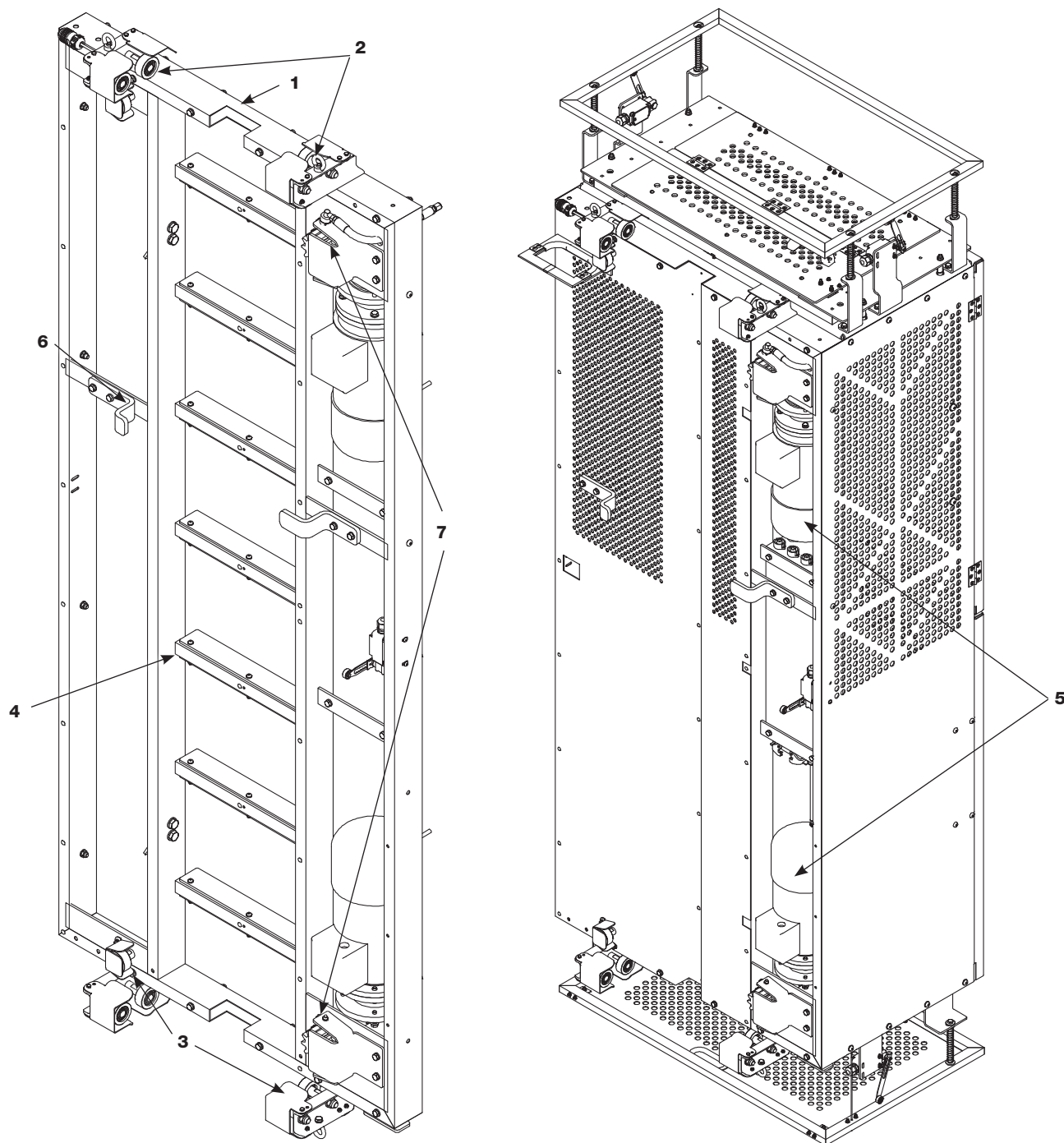
1. Top platform
2. Top mechanical stop
3. Rest platform
4. Pegasus service lift
5. Anchorages
6. Junction box
7. Intermediate arm for electric cable
8. Intermediate platform
9. Travelling cable
10. Bottom platform
11. Ladder rack

3.7 Service lift dimensions



3.8 Main frame

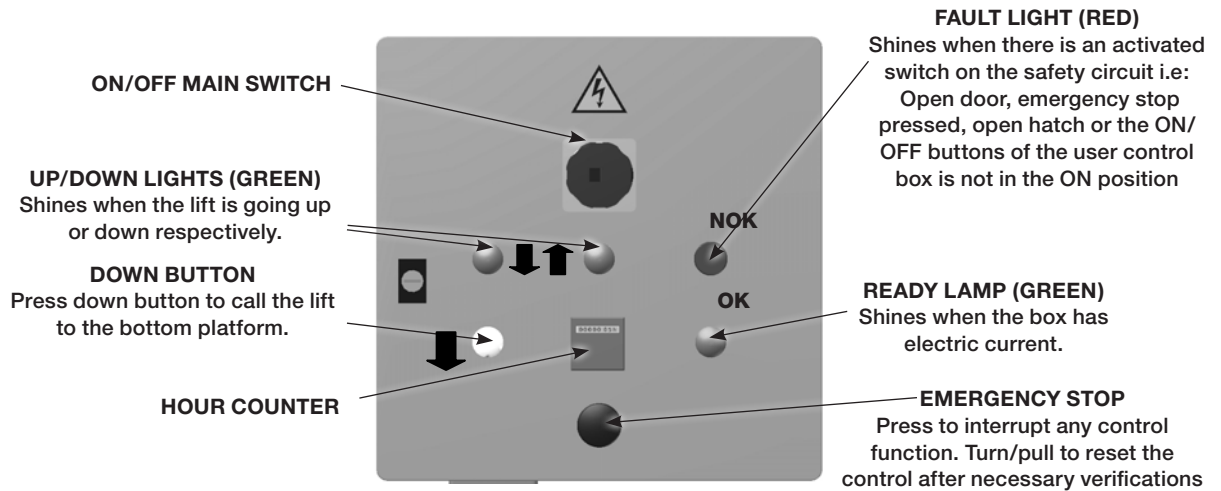
The main frame is a welded steel structure. The traction and guiding systems are bolted to the main frame.



1. Main frame
2. Guiding rollers top
3. Guiding rollers bottom
4. Evacuation ladder
5. Traction system/ 2 Motor groups
6. Anti- derailment brackets
7. Pinions

3.9 Controls

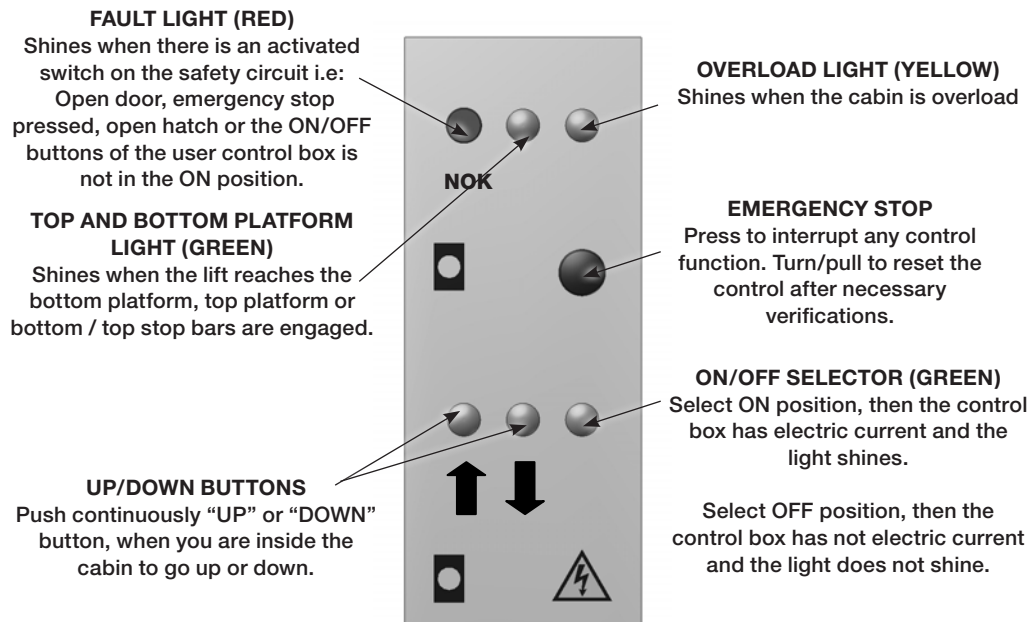
3.9.1 Bottom platform control box



3.9.2 Cabin control box

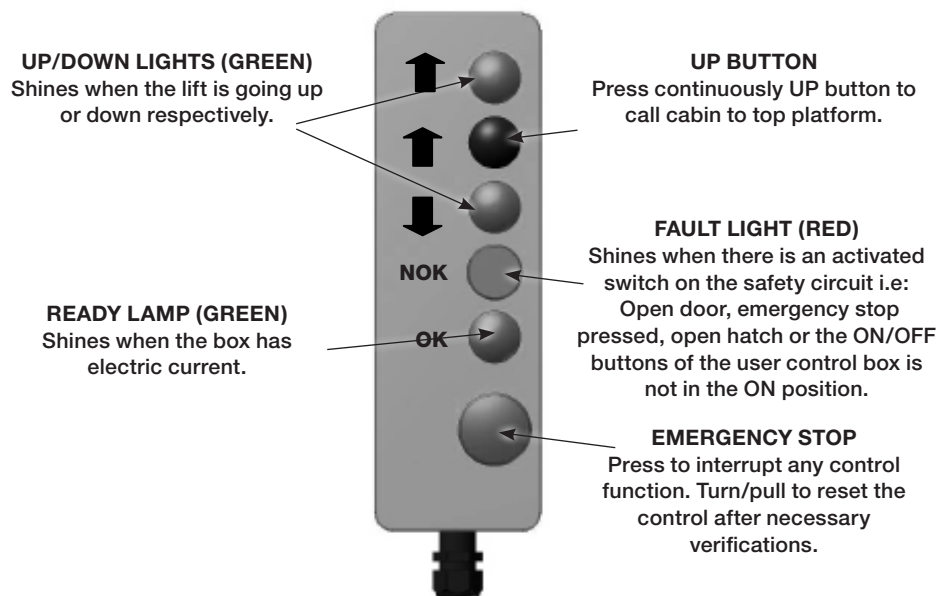


User control box inside the cabin has control priority over control boxes at platforms.

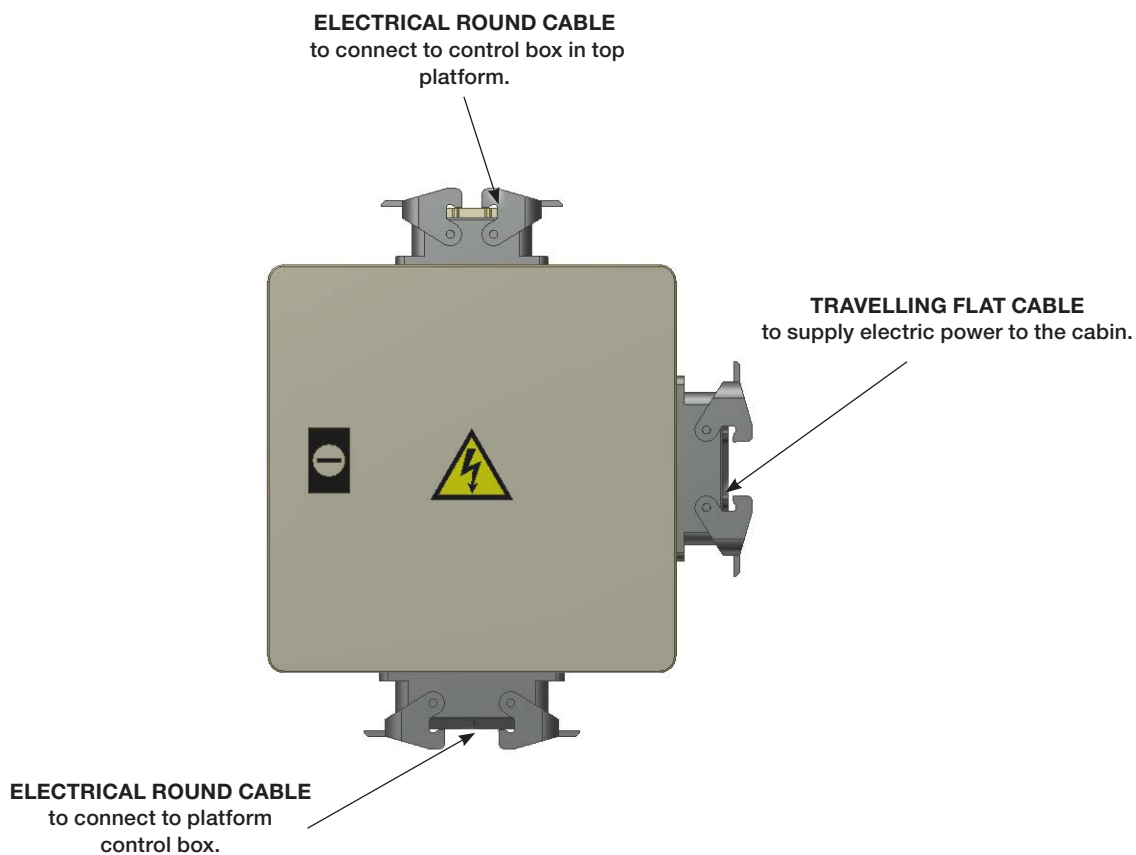


This button has priority over any UP/DOWN BUTTON at the platforms.

3.9.3 Top platform control box



3.9.4 Mid tower junction box



3.10 Service lift doors

Main access to the service lift is done through the double door system installed in the front. The system consists of two hinged doors that open outwards.

This door can be opened at any time. A safety switch monitors the closed function and interrupts control if the door is opened.

A mechanical lock is also installed to lock the doors together to the fixed front.

From outside: turn the key clockwise to open the door, and anticlockwise to close it.

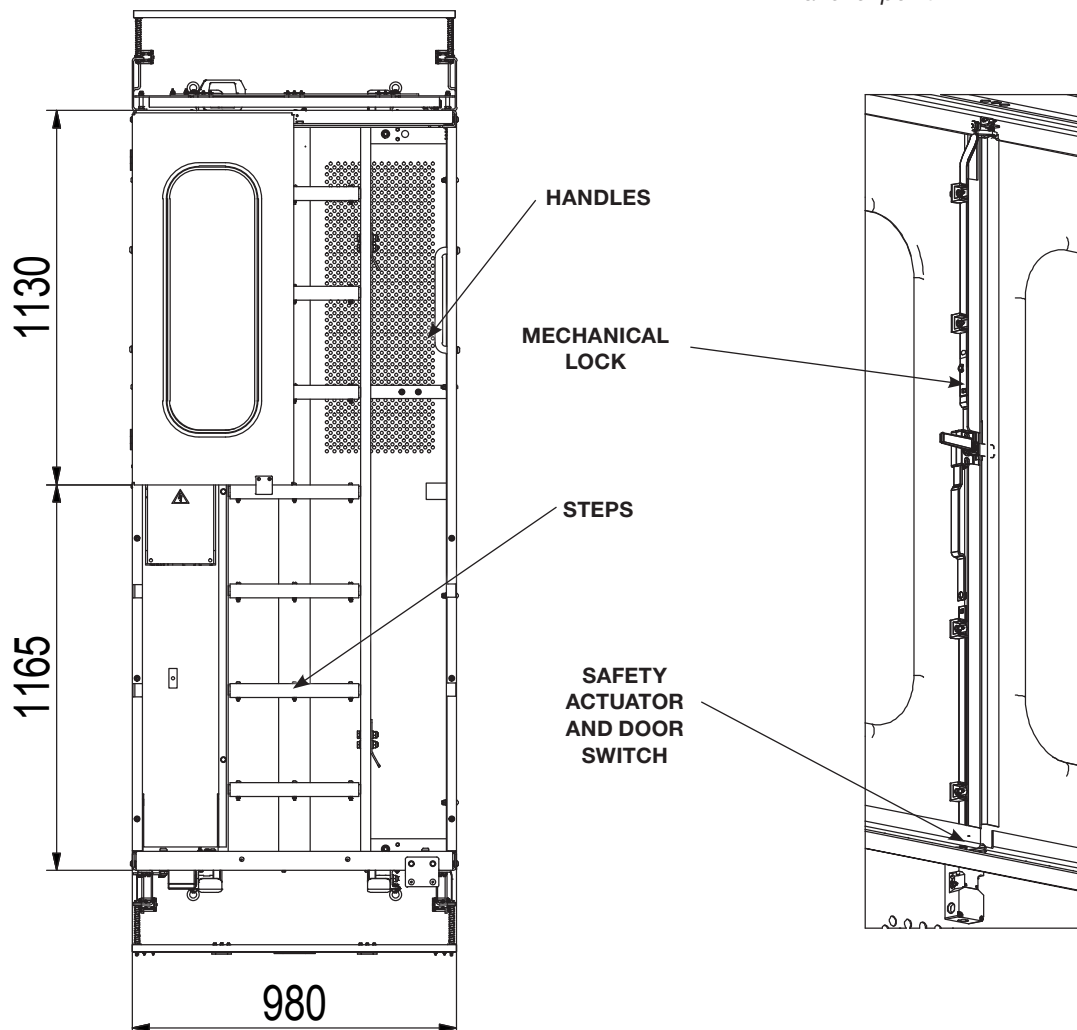
From inside: turn the lever anticlockwise to open the door, and clockwise to close it.

If the doors are not closed properly, the fault light illuminates.

The steps inside the cabin are provided with non-slip surface in order to prevent the risk of falling.

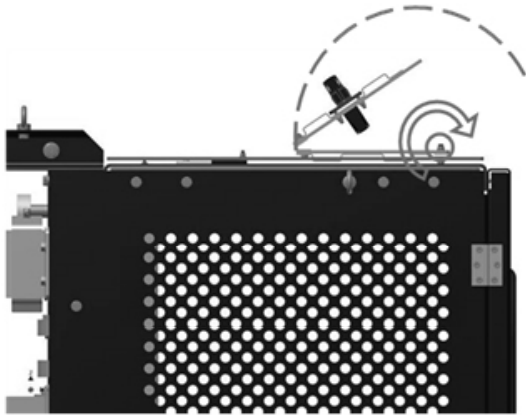


*When the door is open, user(s) **MUST BE** attached with the shock absorber to an anchor point.*

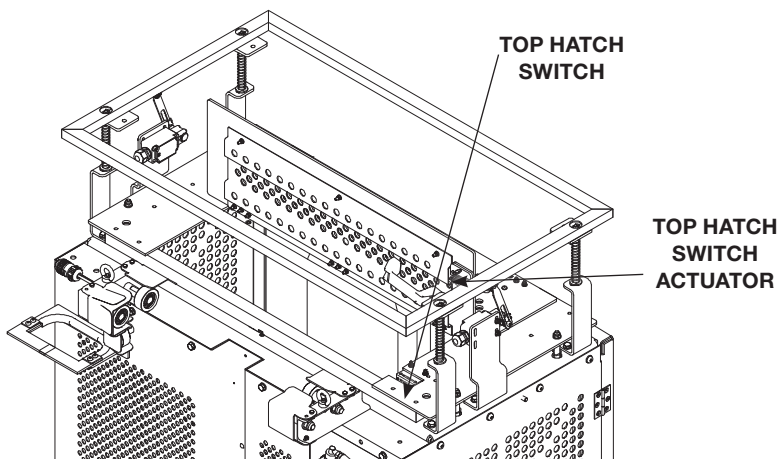


3.11 Top hatch

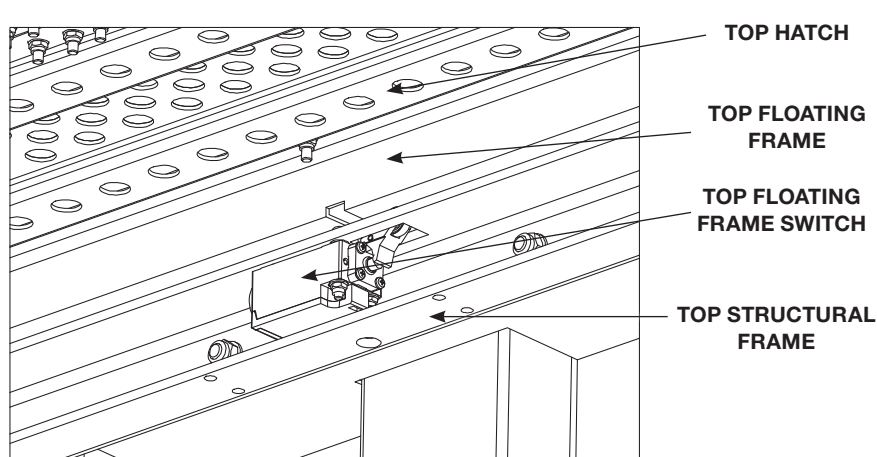
The top hatch consists of a double hinged sheet, that minimizes necessary space to open it.
This hatch is used to evacuate the service lift or to access the top platform.



The dimensions of the clear opening are 640 x 403 mm.
A switch interrupts control if the hatch is open or not properly closed. In this case the fault light illuminates.



The top hatch is mounted over a top floating frame.
If a person stands on the top floating frame, a switch is triggered and control is interrupted. This prevents misuse of the service lift; e.g. persons riding on top.

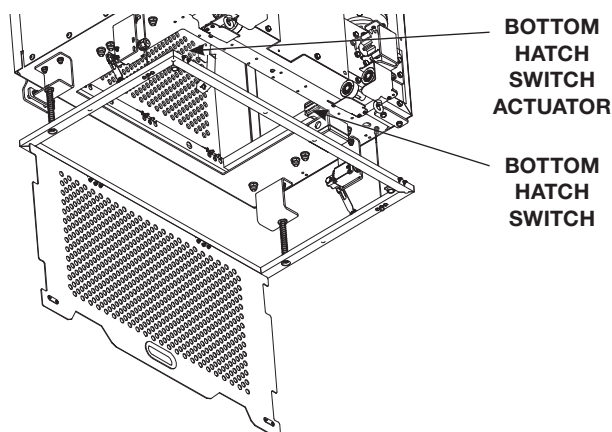


3.12 Bottom hatch

The bottom hatch consists of a perforated sheet that opens inwards. It is used in case of evacuation.

A switch interrupts control if the hatch is open or not closed properly. In this case the fault light of the cabin control box illuminates.

The dimensions of the clear opening are 600 x 400 mm.

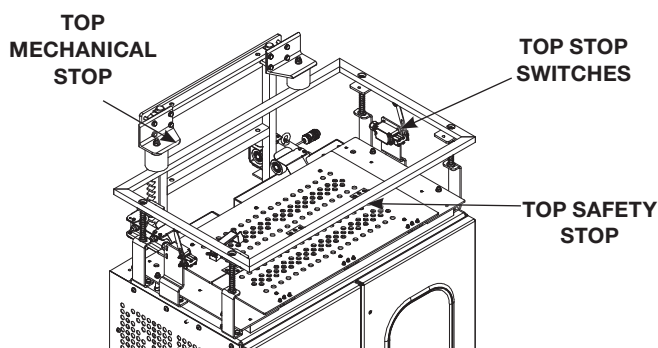


3.13 Top safety stop

The top safety stop interrupts ascent if:

1. It encounters an obstacle.
2. It reaches the top platform.

Descent is still possible; i.e. to remove the obstacle.

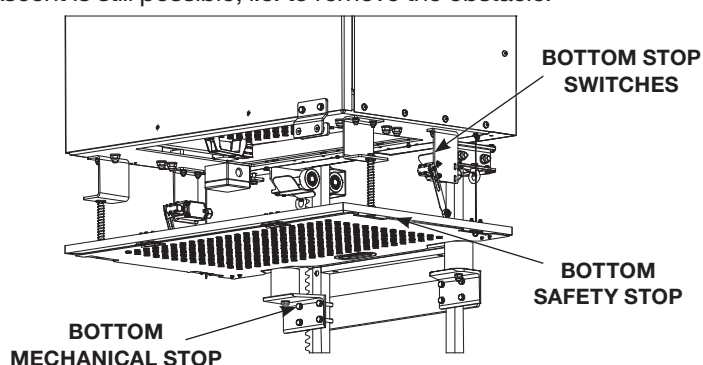


3.14 Bottom safety stop

The bottom safety stop interrupts descent if:

1. It encounters an obstacle.
2. It reaches the top platform.

Ascent is still possible; i.e. to remove the obstacle.



3.15 Emergency limit stop switch

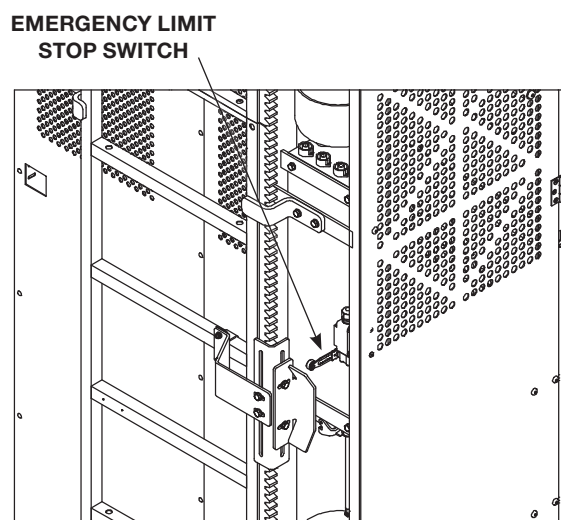
The emergency limit stop switch interrupts the control if top stop switches fail.

To release the switch on the top plate:

Perform manual descent some metres.

This switch is triggered by the activation plates located on bottom and top platforms.

To release the switch on bottom plate: temporarily remove the switch lever and put the lever back afterwards and verify adjustment.

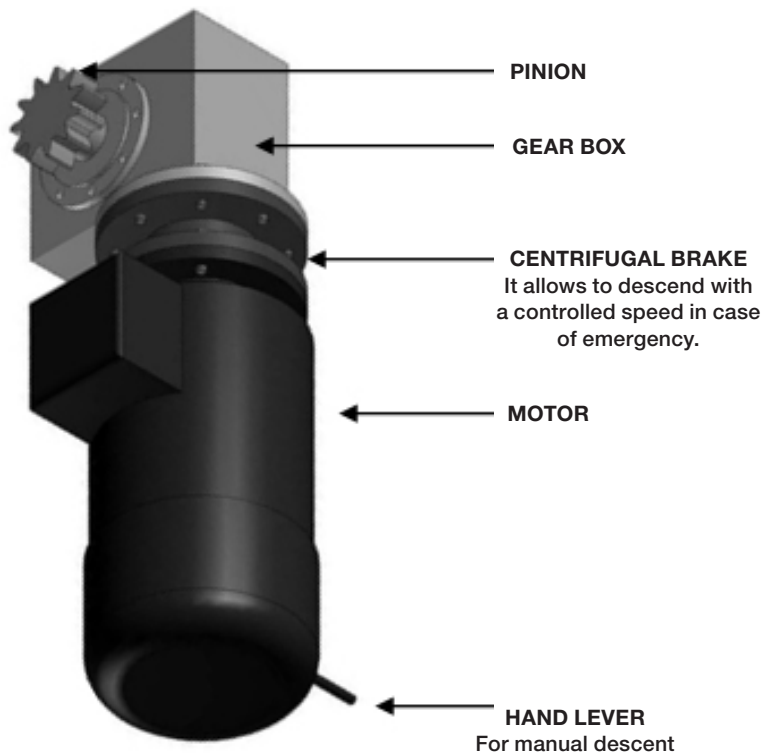


3.16 Top and bottom mechanical stops

Top and bottom mechanical stops are installed on the ladder and act as travel limits.

3.17 Traction system

The traction system is rack and pinion type. The system has two motor group working on the same rack. They are installed on the main frame of the cabin. Each motor groups has a centrifugal brake, a gear box, a pinion and a brake motor. Each motor brake includes a manual release lever allowing a manual descent in absence of electric current.

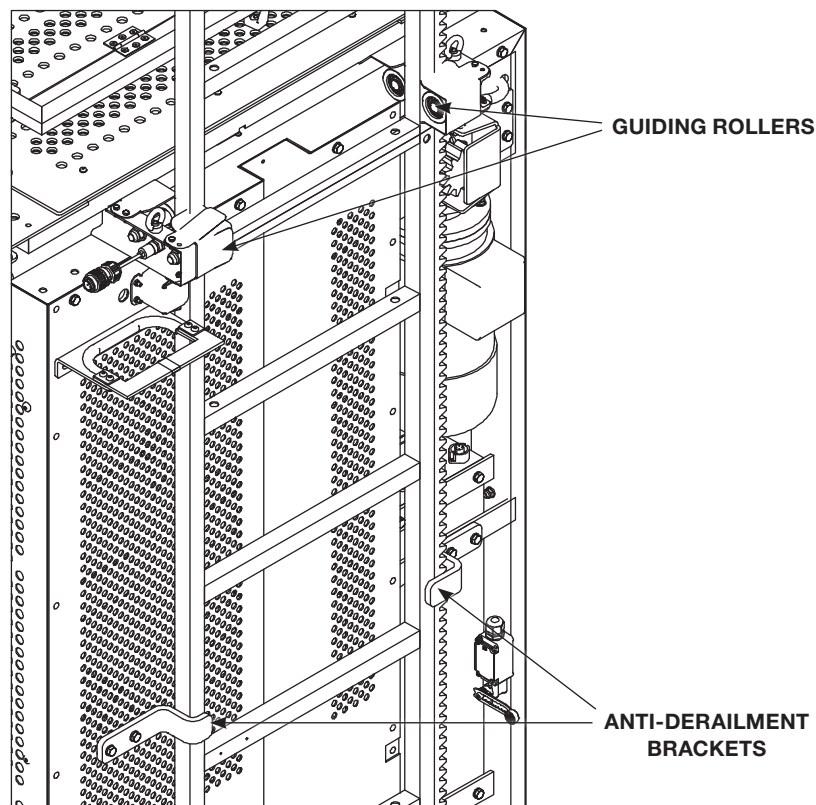


3.18 Guiding and anti-derailment system

The service lift is guided along the stiles of a ladder by means of ten guiding rollers.

An inductive sensor detects the presence of the stile. If the stile is not detected (bigger distance than setting), control is interrupted, avoiding derailment of the service lift.

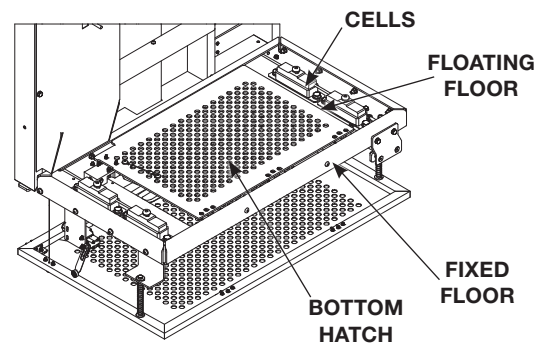
The service lift features two anti-derailment brackets that prevent derailment if guiding rollers fail.



3.19 Overload limiter

Electronic equipment is installed inside the cabin control box. The overload detection system prevents any movement of the service lift in the event of an overload. In case of an overload, the overload light (yellow) illuminates.

This system consists of a floating floor with four load cells. The load cells send the load signal to the electronic equipment.

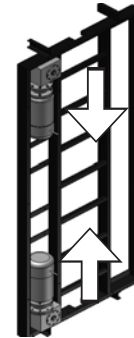


3.20 Manual descent system

Each motor group features a hand lever, that allow manual release of the motor electromagnetic brake. Once the motor brakes are released, the service lift descends with a controlled speed limited by the centrifugal brake installed in each motor group.



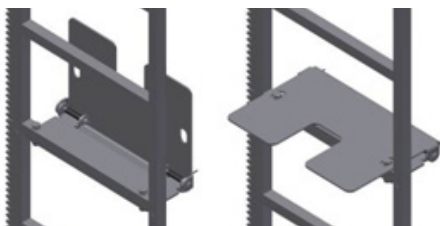
*Push hand levers Upwards and downwards
At the same time to perform manual
descent and always look through
the perforated sheet holes.*



3.21 Rest platforms

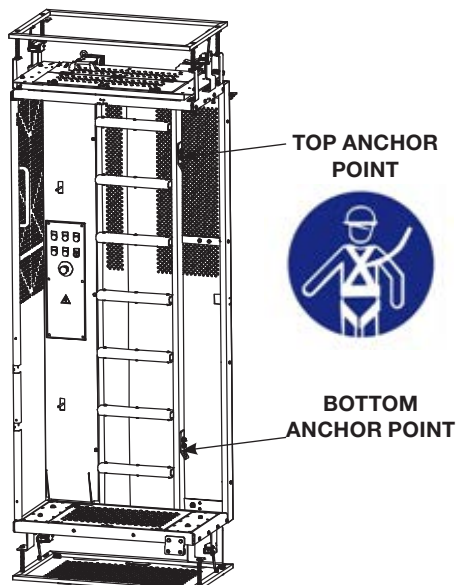
There is a rest platform at least every 6 metres. The rest platforms are attached to the ladder on the ladder section connection.

Rest platforms are self folding using torsion springs so they do not interfere with the cabin movement when they are not used.



3.22 Anchor points for PPE

The service lift is equipped with two anchor points inside the cabin. In case of evacuation, the evacuation procedure must be followed (see "Safety measures").



3.23 Information signs and documents

The following documents, signs and labels are supplied with the service lift and shall always be available.

Document	Position
Serial number plate	Cabin
Manual	Cabin
Quick guide	Cabin
Use of PPE label	Cabin
Work load / N° persons label	Cabin
Warning risk of falling	Cabin
Warning risk of crushing	Cabin
Label emergency descent	Cabin
Wiring diagram	Bottom platform control box
Electric warning disconnection label	
Alignment labels	Cabin and each landing
Lubrication label	Cabin

4. Instructions for use

4.1 Cautions

Aspects to consider for a good use of the service lift:

1. No person is on the ladder when the service lift is in operation.
2. The elevator is free of objects.
3. No objects are located on the top of the cabin.
4. When the door is open user(s) MUST BE attached with shock absorber to an anchor point.
5. Electrical system is properly insulated.
6. The manual, the evacuation procedure and quick guide must be accessible in the cabin.
7. Manual operation is done in case it is strictly necessary.
8. Before any maintenance operation check that the service lift is out of service.
9. To facilitate manual operation use walkie-talkies between operators.



Ladder and rest platforms must be used only for evacuation or when the service lift is out of service.

4.2 Prohibited uses



The following prohibitions shall be observed when using the service lift. The consequences of not following them are extremely hazardous to the physical integrity of the users.

It is prohibited to:

1. Use the service lift beyond its intended purpose.
2. Operate the lift without following the safety warnings and operating instructions.
3. Overload the service lift more than its rated load.
4. Try to repair machine components. Only personnel from AVANTI or competent persons certified by AVANTI are allowed to perform service on the machine.

4.3 Operation from inside the cabin

1. Turn the ON/OFF on the bottom platform control box to the ON position.
2. Open the door, climb the fence-railing and go inside the cabin and close the door.
3. Turn the ON/OFF buttons on the user control box to the ON position.
4. To go up or down, push and hold the UP or DOWN button as needed.

4.4 Operation from bottom platform

To send ¹⁾ or call the service lift from the bottom platform control box:

1. Check that the ready light is illuminated.
2. Check that the fault light is not illuminated.
3. Press and hold the UP ¹⁾ or DOWN button.



Coordinate send ¹⁾ or call actions between personnel by means of walkie-talkies.



Transportation of persons is forbidden if the operation is controlled from the platforms.

4.5 Operation from top platform

To send ¹⁾ or call the service lift from the top platform control box:

1. Check that the ready light is illuminated.
2. Check that the fault light is not illuminated.
3. Press and hold the UP or DOWN ¹⁾ button.

¹⁾Note: Send function is only available in send and call configuration.

4.6 Landing alignment

The cabin can be landed at any platform totally aligned to permit safe egress and ingress. To do so:

1. Travel to desired platform (bottom, intermediates and top one).
2. Locate the cabin so that alignment label of inside the cabin overlaps alignment label of the platform.
3. Proceed to egress or ingress the cabin.

4.7 Enter and exit cabin

4.7.1 Double door

To enter the cabin:

1. Open the door and attach the shock absorber to the cabin anchor point.
2. Climb the fence-railing holding the handles.
3. Climb down using the cabin steps.

To exit the cabin:

1. Attach the shock absorber to the cabin anchor point and open the door.
2. Climb up the cabin using the cabin and holding the handles.
3. Climb down the fence-railing to the platform.

4.7.2 Top / Bottom hatch

To enter the cabin:

1. Climb the ladder attached to the fall protection system or attach the shock absorber to the tower anchor.
2. Open the hatch.
3. Attach the shock absorber to the cabin anchor point.
4. Release the fall protection device or shock absorber from the tower anchor point to enter the cabin.
5. Climb inside the cabin holding the handles and the cabin main frame ladder as support.
6. Close the hatch

To exit the cabin:

1. Attach the shock absorber to the cabin anchor point.
2. Open the hatch.
3. Climb out of the cabin using the handles and the cabin main frame ladder as support.
4. Attach to the fall protection system or attach the shock absorber to a tower anchor point.
5. Release the shock absorber on the cabin anchor point.
6. Close the hatch.



Wind turbine manufacturer must ensure that access to the upper platform or nacelle can be done safely to avoid risk of falling.

4.8 Emergency stop button

Release the UP/DOWN buttons and the service lift should stop. If it does not, push the emergency stop, and all controls should be disabled.
Turn / pull the emergency stop button to reset the control.

4.9 Manual descent

In case of power failure or an operation fault, a controlled descent without power can be performed.

To do so:

1. Remove the seals of the hand levers of the motor brake.
2. Check that there are no obstacles or person on the way.
3. Push upwards or downwards the two hand levers at the same time. The service lift will start travelling down.
4. To stop, simply loosen the hand lever.

4.10 Rest platforms

If use of rest platforms is needed:

1. Climb up on the ladder to be one step above the rest platform.
2. With the safety of all your PPE, push down the rest platform with your foot.
3. Once platform is properly supported on the rung, stand over it with both feet.
4. The rest platform returns to its folded position once it is not in use.



Manual operation is done in case it is strictly necessary.



Always look through the perforated floor of the cabin to see if anyone is standing on the ladder.



Use walkie-talkie to report about the manual descent.



*Always wear all the PPE and attach the fall protection device in the fall protection rail system of the ladder.
User(s) in a rest platform **MUST ALWAYS BE** attached safely to the fall protection system.*



Rest platforms must not be used unless necessary. For example if the service lift is out of service.

4.11 Service ladder

The service lift uses a ladder as support and guide. In case of failure of the lift, this ladder is used to evacuate people (see “Safety measures”).



Service ladder may not be used, unless necessary. For example if the service lift is out of service.

5. Out of Service

1. Securing the service lift:

Bring the service lift all the way down, until the bottom stop switch stops the cabin.

2. Turn off the main switch to prevent inadvertent operation of the lift:

Turn the main switch to the OFF position. Power supply is now interrupted. Mark the lift “OUT OF SERVICE” and padlock as necessary. Contact the service technician for repair.



6. Maintenance

A maintenance is required and necessary:

- To avoid premature wear
- To prolong the lifetime of the machine
- To maintain the level of safety which the service lift was designed and manufactured to.

6.1 Maintenance planning

Time (Performance)	Component
Daily (Supervisor)	Cabin visual inspection
Safety circuit	Electrical cable
Annually (Expert)	Electrical cable
Annually (Expert)	Gear box, centrifugal brake, motor brake, pinions, ladder rack
Annually	Torques assurance, overload



Perform the inspections filling in the "Inspection checklist" and the "Operation log sheet".



Before any maintenance operation check that the service lift is out of service.



Inspection may only be performed by AVANTI or competent person certified and authorised by AVANTI.



If any faults occur during work,
- Stop working,
- If required secure the workplace and
- Rectify the fault!



Make sure that nobody is exposed to danger below the service lift, for instance from falling parts.

6.2 Cautions

Before any maintenance task, ensure that walking way surfaces are dry and not slippery.

During maintenance tasks, personnel shall:

- Wear at least the following PPE: fall arrest equipment (when falling height is more than 2 m), hand gloves, helmet, safety glasses and working gear.

- Place cabin at bottom platform and disconnect power supply.
- Use an electricity measuring tool when performing inspection of electrical components.
- Use a hand winch attachable to the ladder when handling big/ heavy loads and shall be performed at least by 2 persons.
- Panel parts shall be removed to facilitate access to confined spaces.
- Guiding rollers shall be replaced one by one.
- Use a cable grip when replacing travelling cable.
- Keep service lift doors closed when using a 3-step ladder.



Only AVANTI or qualified personnel authorised by AVANTI shall perform electrical installation tasks.

6.3 Daily inspection by the supervisor

6.3.1 Travel zone:

1. Ensure that there are no obstacles within the service lift's travel zone which may obstruct the travel of the cabin or hit the cabin.
2. Ensure that the ladder rack is solidly and safely fixed.

6.3.2 Visual inspection:

1. Check that the service lift components are mounted in accordance with the specifications and without any noticeable defects or missing components.

2. Check that the traction system (ladder rack & pinion) is not damaged or jammed.

3. Check that the guided system is not damaged or jammed.

4. Check that the two motor groups are in good conditions and not damaged.

6.3.3 Functional inspection:

Check that the safeties are in place and working.

6.3.3.1 PLATFORM CONTROL BOX:

1. Main switch ON/OFF: Turn the ON/OFF electric isolator on the bottom platform control box to the OFF position. The green light shall be OFF. The service lift shall not run. Turn it ON; the green light shall be ON.

2. Emergency stop: The service lift shall not move UP/DOWN. Release the emergency stop and drive the lift UP approximately 1 m.
3. Press UP/DOWN buttons on the control box. The lift should travel upwards or downwards.

6.3.3.2 CABIN CONTROL BOX:

1. ON/OFF button: Turn the ON/OFF button on the user control box to the OFF position. The green light shall be OFF. The service lift shall not run. Turn it ON; the green light shall be on. The service lift shall run.
2. Emergency stop: Press the emergency stop button. The service lift shall not move UP/DOWN. Release the emergency stop and drive the lift UP approximately 1 m.
3. Fault light: Open the door or press the emergency stop, the red fault light on the control box shall be on.
4. Top and bottom hatch: Open the hatch, the fault light in red shall be ON and the lift shall not move UP/DOWN.
5. Service lift door: Open the door, the fault light in red shall be ON and the lift shall not move UP/DOWN.
6. Drive the service lift down until the bottom safety stop hits the bottom mechanical stop. The lift shall stop.
7. Drive the service lift up until the top safety stop hits with the top mechanical stop.
8. Pull down the top hatch handle until the roof switch is activated, the fault light in red shall be ON and the lift shall not move.

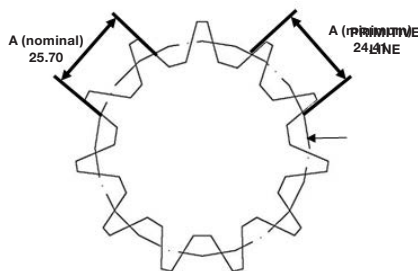
6.4 Yearly inspection

6.4.1 Pinions

Check carefully that the pinions are free from deterioration, damage or abrasion.

Wear limit:

To evaluate the wear of the pinion, "A" dimension measured on the primitive line shall range between 24.41 and 25.7 mm.



Pinion replacement criteria is shown in table below:

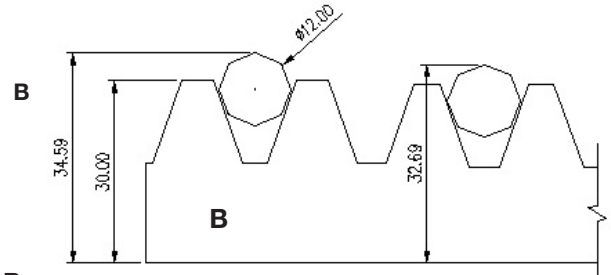
DIMENSIONS	NEW PINION (mm)	CHANGE PINION (mm)
A	25.70	< 24.41

6.4.2 Ladder rack

1. Check carefully that the rack is free from deterioration, damage or abrasion.
2. Check that the ladder mast has no cracks, dents or damages.

6.4.2.1 Wear limit:

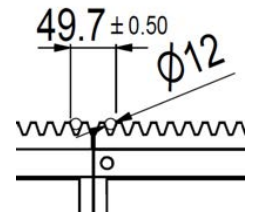
1. Using a calibrated rod of Ø 12 and check that dimension control "B", as shown in the picture, is between 32.69 and 34.59 mm. Measure the rack wear on each mast section.



Rack replacement criteria is shown in table below:

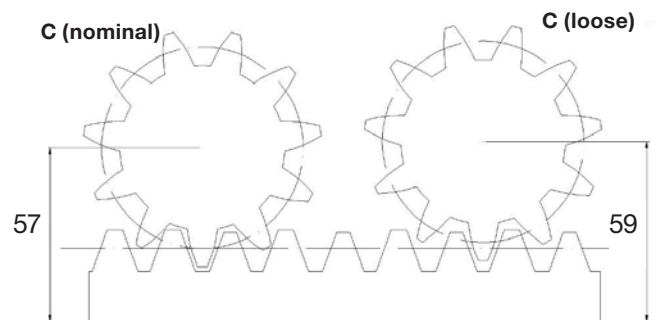
DIMENSIONS	NEW RACK (mm)	CHANGE RACK (mm)
B	34.59	< 32.69

2. Using two calibrated rods of Ø 12 mm check that distance between ladder sections dents is 49.7 ± 0.5 mm.



6.4.2.2 Looseness limit:

To evaluate the looseness, check of control dimension "C" shall be between 57 and 59 mm.



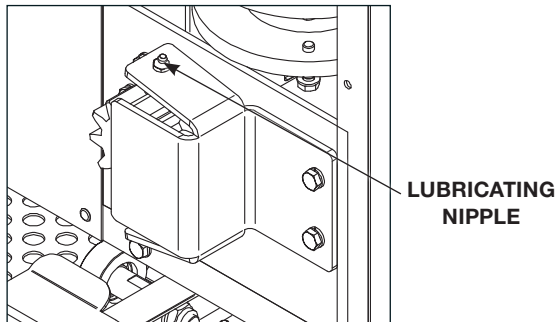
Rack replacement criteria is shown on table below:

DIMENSIONS	NEW RACK (mm)	CHANGE RACK (mm)
C	57	> 59

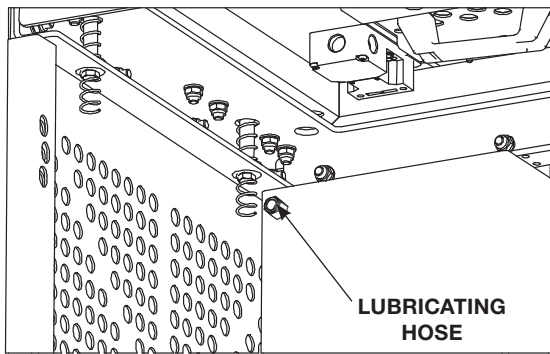
6.4.2.3 Lubricate the rack

Check status of old lubricant on rack and pinions. If maintenance required proceed as follows:

1. Place lift at bottom platform and disconnect power supply.
2. Clean old lubricant off the rack and pinions.
3. Use a grease gun and a zipper sleeve to lubricate low pinion through lubricating nipple.



4. Turn on the power supply and enter the lift.
5. Remove female adaptor from grease gun and connect gun to lubricating hose. Its location is indicated by means of a lubricating point sign.



6. Apply lubricant to top pinion from inside the cabin throughout ascent.
7. Repeat lubrication throughout descent.
8. If necessary clean excess of new lubricant off the rack.



*Clean and lubricate the rack every time you replace a section of the ladder.
If use is more severe, it will be necessary to lubricate more often.*

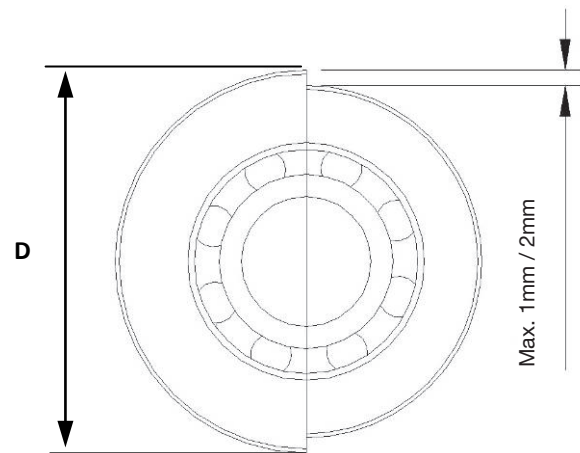
The type of grease can be KRAFFT KGP 2M or equivalent. For low temperature use LUBEKRAFTT KMG or equivalent.

6.4.3 Guiding rollers

Check that the outer surface of the rollers is uniform and free from damage.

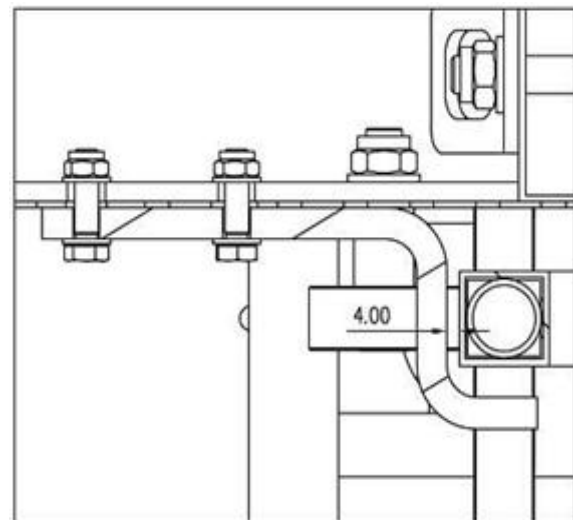
Wear of surface shall not be bigger than 1 mm on guiding rollers and 2 mm on counter guiding rollers. Check that control dimension "D" is between 48 and 50 mm on roller guides and between 46 and 50 mm on counter roller guides.

NEW COUNTER GUIDING ROLLER (mm)	CHANGE COUNTER GUIDING ROLLER (mm)
50	>48
NEW GUIDING ROLLER (mm)	CHANGE GUIDING ROLLER (mm)
50	>46



6.4.4 Anti-derailment bracket

Check that gap between anti-derailment bracket and ladder stile is 4 mm.



6.4.5 Torques Assurance

Check tightening torques of all screw connections with approved and calibrated torque wrench in the following cases:

1. In tower factory, during assembly of ladder section to tower section.
2. On site, pre-commissioning, and in each annual inspection.

See joints to be checked and appropriate tightening torques for each case in the list below:

Ladder:		TORQUE (N•m)	
		ASSEMBLY IN TOWER FACTORY	ASSEMBLY ON SITE
JOINT	METRIC		
Rung U-bolts	12	50	50
Rest platforms attachment	12	50	50
Ladder sections	12	50	50
Ladder anchorages – Tower brackets	12	50	12
Rung fittings of safety rail	6	8	8
Ladder – Top mechanical stop	8	15	15
Ladder – Bottom mechanical stop	8	15	15

Motor group:		TORQUE (N•m)	
		ASSEMBLY IN TOWER FACTORY	ASSEMBLY ON SITE
JOINT	METRIC		
Gear box – Centrifugal brake	8	15	15
Motor group – Main structure	8	15	15
Motor – Centrifugal brake	8	15	15

Cabin:		TORQUE (N•m)	
		ASSEMBLY IN TOWER FACTORY	ASSEMBLY ON SITE
JOINT	METRIC		
Fall protection anchor point – Cabin	12	50	50
Roller shafts – Main structure	12	50	50
Counter roller guide shafts – Main structure	12	50	50
Anti-derailment brackets	8	15	15

6.4.6 Overload, static and dynamic tests

1. Overload detection system test: check that the overload detection system works by applying a load of 125% of working load limit to the lift floor. The service lift shall not move UP and the overload light on the control box shall be on.
2. Static test: apply a load of 125% of working load limit to the lift floor. The service lift shall not show any damage or cracks.
3. Dynamic test: apply a load of 110% of working load limit to the lift floor. The service lift shall be able to move UP.



If the overload detection system fails, an expert must verify the system.

6.4.7 Motor group

6.4.7.1 Gear box

1. Visually check for oil leaks. In case oil leaks are found, exchange the gasket on the gear box cover, and re-fill with oil as needed.
2. Close the cover and ensure that the correct torque is applied.

6.4.7.2 Centrifugal brake

1. With cold centrifugal brake, perform a manual test in power descent on approximately 2 m. The descent has to be done at maximum speed of 24 m/min. If the speed is more than 24 m/min, put the lift out of service and call service for replacement as the centrifugal brake means are not in good conditions.
2. Review lining and hubs. The lining of the centrifugal brake has a friction surface that is worn with use. If thickness is reduced to half the original, replace linings and hubs.



This operation shall be done only by qualified personnel and following the centrifugal brake manufacturer instructions.

6.4.7.3 Motor brake

1. Load the service lift with a load of 1.1 times the nominal load. Release one of the two motor brakes by pulling its hand lever. While keeping the brake open, push the UP button and stop after 0,5 m. The cabin should stop and the brake must be able to hold the cabin. Repeat this operation 3 times.
2. Repeat the operation with the other motor brake. If any of the two motor brakes fail to stop and hold the service lift in position, proceed as follows:
3. Measure the air gap. If the air gap is greater than specified by the manufacturer and the brake disc thickness is sufficient, readjust the air gap according to the motor brake manufacturer's specifications. Check the brake discs and the springs for irregularities or damages. If any damages or broken parts are found, replace motor brake.

6.5 Ordering spare parts

Only original parts must be used. Spare parts list is available from AVANTI upon request.

7. Troubleshooting

All tests and repairs to the electric components shall be performed by an **authorised electrician only!**






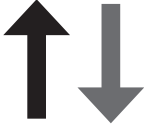
The wiring diagram is placed in the traction hoist's power cabinet.

Repairs to the motor group and to the system's supporting components shall be performed by **qualified installers only!**



If these steps do not identify the cause and rectify the fault: consult a qualified electrician or contact the manufacturer.

Breakdown	Cause	Solution
<p>The service lift cannot ascend nor descend.</p>   <p>DANGER! Attempting to use the lift will jeopardize work safety.</p>	A1 The fixed EMERGENCY STOP button is activated.	Turn this button clockwise until it moves out to deactivate it.
	A2 Rack or pinions are damaged.	a) Check the damage. b) Evacuate the cabin.
	A3 The service lift is stuck on an obstacle.	a) Remove the obstacle. b) Test the operational safety of affected tower sections. c) Inform the supervisor.
	A4 Power failure. a) Main switch is set to OFF. b) Grid voltage is interrupted. c) Supply between grid connection and control is interrupted.	a) Turn the main switch to ON. b) Find the cause and wait for the power to return. c) Test and if necessary repair the supply cable, guide wires, fuses, and/or wiring from the control box.
	A5 Two phases are changed in the supply.	Have an electrician switch the two phases in the plug.
	A6 The hatches or door switches are triggered.	Check that door and hatches are properly closed.
	A7 Motor thermal protection.	a) Rearm. b) If repeated, contact AVANTI.
	A8 ELECTROMAGNETIC BRAKES do not open.	a) Check voltage to the electromagnetic brakes. b) Check the springs. c) Check the brake disc. d) Regulate the brake disc.
	A9 MAGNETIC THERMAL CONTROL.	a) Rearm. b) If repeated, contact AVANTI.
	A10 CONTROL DIFFERENTIAL.	a) Rearm. b) If repeated, contact AVANTI.
	A11 OVER VOLTAGE PROTECTION.	a) Rearm. b) If repeated, contact AVANTI.
	A12 EMERGENCY LIMIT STOP SWITCH is activated.	a) On top platform, manually take the lift down until the switch is released. b) On bottom platform, disassemble the bottom plate until the switch is released. c) Check the position of the plates. d) Check the top and bottom mechanical stop position.
	A13 OVERLOAD.	a) Test and if possible reduce the load. b) If repeated, contact AVANTI.

Breakdown	Cause	Solution
<p>The service lift can descend but cannot ascend.</p> 	B1 The service lift is stuck on an obstacle.	Carefully move the service lift downwards and remove the obstacle. Test the operational safety of the affected platform components. Inform the supervisor.
	B2 TOP SAFETY STOP is activated.	a) Check the springs. b) Move the lift down until the top stop switches are released.
	B3 INDUCTIVE SENSOR is activated.	a) Check section ladders. b) Check the status LED.
<p>The service lift can ascend and descend but motor hums loudly.</p> 	D1 Motor is damaged.	Contact AVANTI.

8. Transport and Storage

Depending on agreed transport and storage conditions with the customer, the following methods are standard ways for the transport:

A) Cabin

- Land transport: rear support over pallet, non stackable. Dimensions: 3000 x 800 x 1200 mm
- Sea transport: package using wooden box and plastic shrink on a pallet. Dimensions are 3000 x 800 x 1200 mm.

B) Installation accessories

The installation accessories other than mast sections (rest platforms, power cable, etc) are supplied on European pallet.

C) Mast sections

Mast sections are supplied on pallet. Dimensions: 1500 x 800 x 1000. If special transport and storage requirements are needed, customer must specify them to AVANTI prior to delivery.

9. Installation

9.1 Interface requirements

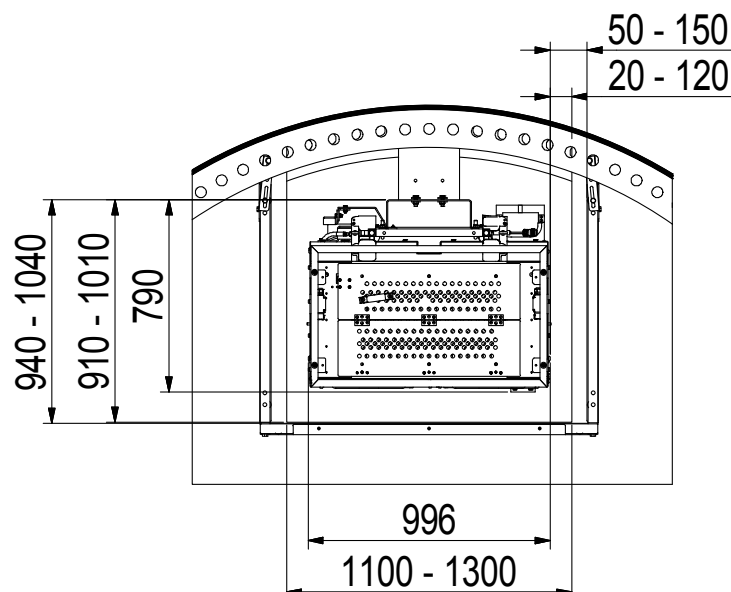
The following information is necessary for the correct integration of the service lift inside a wind turbine tower.

9.1.1 Height and angle

The service lift can be installed on towers up to 150 m high, and with a maximum inclination angle to the ladder axis of $\pm 2^\circ$ and of $\pm 0,5^\circ$ for every 3 m of ladder.

9.1.2 Lift holes at platforms and air gap to tower parts

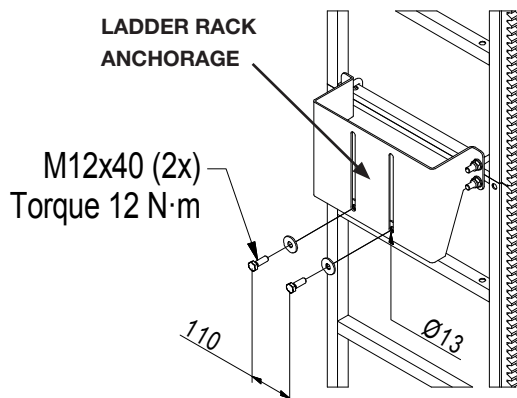
The service lift must have an air gap of at least 20 mm around it along the tower to avoid collision with tower components. The wind tower manufacturer must verify this as part of the integration process not only in the static position but also considering possible movement of components inside the tower as a consequence of the tower sway.



The components subjected to possible movement inside the tower may include, but are not limited to, dampers, wire ropes, cables, doors, hatches, etc. The service lift needs a gap of 500mm below the lowest landing area to accommodate the bottom buffers and power cable.

9.1.3 Tower support brackets

The ladder rack is attached to the tower structure at a distance of max 3000 mm. The tower support brackets must be so designed that the ladder rack anchorages can be mounted. The connection between the tower support brackets and the ladder rack anchorages is done with M12 bolts A2-70 tighten with a torque of 50 N·m in the tower factory but with a torque of 12 N·m on site once the tower has been erected and before the cabin is going up. Reaction forces on connection bolts must be considered in the design of the tower brackets. This information may vary with the installation characteristics. Contact AVANTI to get the information.



9.1.4 Wind turbine electrical supply requirements

Electrical supply requirements	
Power Supply Type	3 Phase +PE + N
Voltage	400 V \pm 5 %
Frequency	50 / 60 Hz
Fuses	16 A
Protection	Acc. To EN 60204 - 1

9.1.5 Other requirements

The wind turbine manufacturer must provide any other means necessary to ensure the safe use of the service lift according to AVANTI recommendations and its own risk assessment for the integration that shall include items which are not under AVANTI's scope.

9.2 Cautions on site

All installation process must be made according to the installation drawing supplied by AVANTI. Prior to installation, check the instructions and drawings. Verify that all the needed components and necessary tools are available.



Prior to installation, ensure that building sections involved will be able to withstand the service lift loads.



Prior to installation, ensure that all parts are available and fully functional.



Prior to installation, ensure that platform holes are protected with fences.



Wear PPE for protection against falls if falling height is higher than 2 m.



Installation shall be performed by AVANTI or trained personnel by AVANTI.



The customer must define the maximum allowable wind speed ensuring safe installation.



At the end of the workday security measures must be taken to put the elevator out of service and make the ladder accessible. Place a warning sign: SERVICE LIFT OUT OF SERVICE. DO NOT USE

9.3 Assembly in tower factory

9.3.1 Top tower section

1. Install and adjust upper ladder section at the top of the top tower section (see Fig. 1 and installation drawing). Use 15 N·m torque for M8 and 50 N·m for M12.

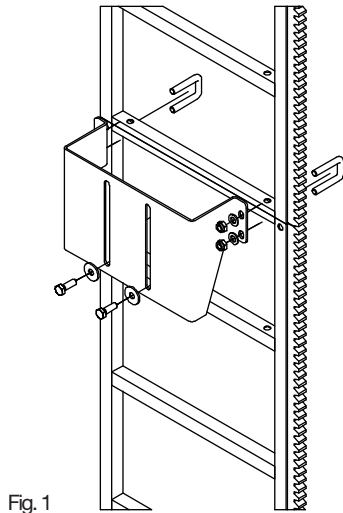


Fig. 1

2. Install the rest of the ladder sections from top to bottom (see Fig. 2).

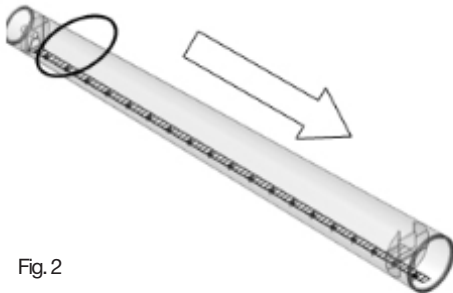


Fig. 2

3. Install the rest platforms approximately every 9 m (see Fig. 3 and installation drawing).



Fig. 3

4. Install the top mechanical stops and the top safety position plate (see Fig. 4 and installation drawing). Use 15 N·m torque for M8 and 50 N·m for M12.



Fig. 4

9.3.2 Intermediate tower sections

1. Install and adjust upper ladder section at the top of the intermediate tower section (see Fig. 1 and installation drawing).

2. Install the rest of the ladder sections from top to bottom (see Fig. 2).

3. Install the rest platforms approximately every 9 m (see Fig. 3 and installation drawing).

4. Install the electric cable arm support (see Fig. 5 and installation drawing).

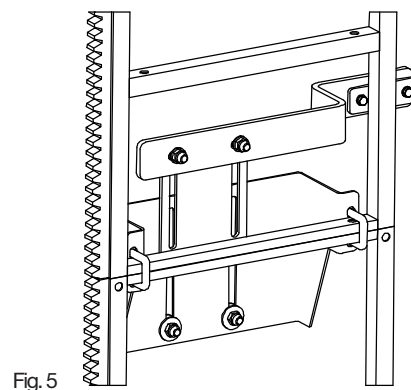


Fig. 5

9.4.3 Bottom tower section

1. Install and adjust upper ladder section at the top of the bottom tower section (see Fig. 1 and installation drawing).

2. Install the rest of the ladder sections from top to bottom (see Fig. 2).
3. Install the rest platforms approximately every 9 m (see Fig. 3 and installation drawing).
4. Position the cabin inside the bottom tower section ensuring that bottom guiding rollers are aligned with a ladder support (see Fig. 6).

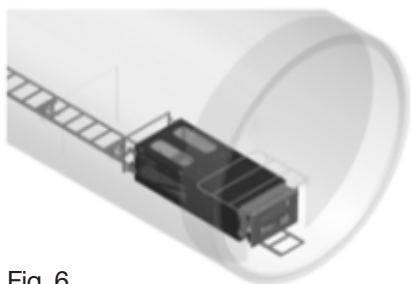


Fig. 6



Mount the guiding rollers shafts into the correct holes: green shafts into green labelled holes and orange shafts into orange labelled holes.

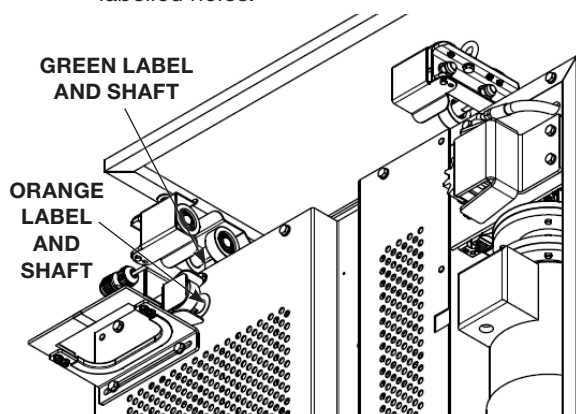


Fig. 7

5. Install the bottom mechanical stop and the bottom safety position plate (see Fig. 8 and installation drawing).

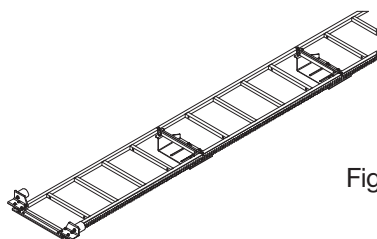


Fig. 8



It is also possible to install the cabin and bottom mechanical stop on site.



Service lift can be used during installation.

9.4 Assembly on site

After the tower sections are erected:

1. Climb up to the second tower flange.
2. While descending to the previous tower flange, loosen connection bolts between the ladder rack anchorages from the tower support brackets.
3. Lower down the loose ladder section until it contacts the previous ladder section, so that no gap exists.
4. Tighten the connection bolts between the ladder sections (see Fig. 9).



Fig. 9

5. Using two calibrated rods of Ø 12 mm check that distance between ladder sections dents is 49.7 ± 0.5 mm.
6. While climbing up, tighten the M12 connection bolts between the ladder rack anchorages and tower support brackets with a torque of 12 N·m (see Fig.10).

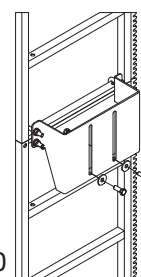


Fig. 10

7. Climb up to next tower flange and repeat actions 2 to 5 until there are no gaps between the ladder sections.
8. Check that gap between anti-derailment bracket and ladder stile is 4 mm.
9. With the service lift on bottom platform, adjust the bottom mechanical stop so that it is possible to open the double door just above the fence railing. The service lift must stop before the cabin main structure hits the bottom mechanical stop (see Fig. 11).

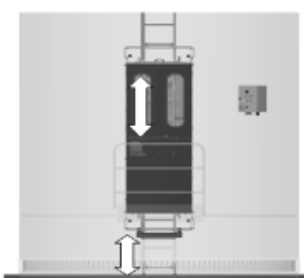


Fig. 11

9.5 Electrical connections on site

Electrical connection of the system must be made in accordance with EN 60204-1.

1. Install the top and bottom platform control boxes and connect the cable connections and the electrical boxes.
2. Use cable strips to attach the fixed cable to the tower internal (see Fig. 12).

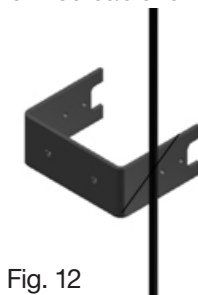
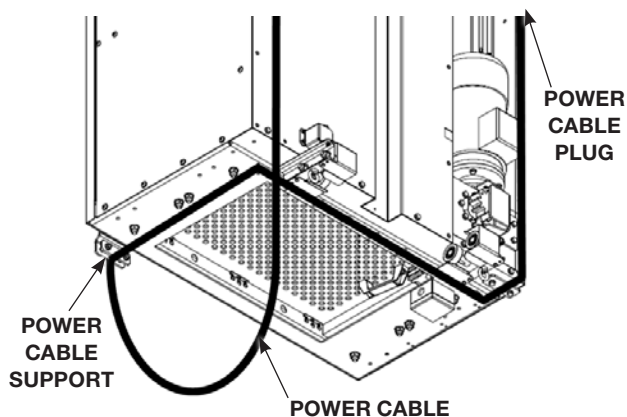


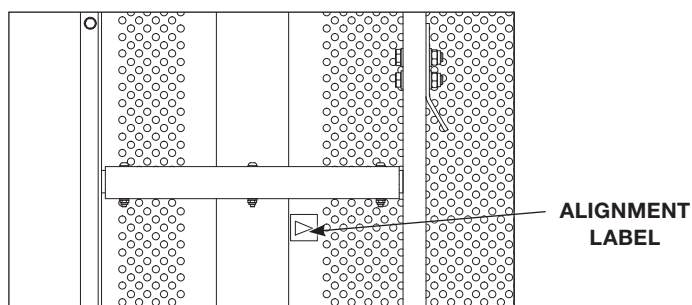
Fig. 12

3. Connect power supply cable.



9.6 Alignment labels installation

1. Stick the alignment label inside the cabin next to the grid of holes at a height of 1,5 m from cabin floor.



2. There is an alignment label for each tower platform. Stick label on right ladder stile at a height of 1,5 m from each platform, and with triangle pointing to the left.
3. For top platform, and for ring shape platforms, stick label on right ladder stile at 0,8 m under each platform, and with triangle pointing to the left.

10. Disassembling

In accordance with local authority regulations disassemble in reverse order and dispose.

Appendix A: Safety measures

In general: Only use service lift if you have received instructions about how to operate the Service Lift in all predictable situations. These instructions can only be given by a person with the proper knowledge e.g AVANTI Trainer or Trainer approved by AVANTI. The following precautions and procedures are to be followed during operation of Service Lift, and if the Service Lift stops and the manual descent cannot be performed.

Operating the Service Lift and the ladder:
Wear PPE at all times (Safety helmet, full body harness, Shock absorber, lanyard and slider compatible with the safety rail).



User(s) in a rest platform MUST ALWAYS BE attached safely with fall protection device.

EVACUATION of personnel from the Lift/Cage is only necessary in very extreme situations. If necessary Avanti recommends the following procedures:

Evacuation through BOTTOM hatch:

1. Attach shock absorber to the bottom yellow anchor point. Position yourself to one side of the bottom hatch, in the same side as the bottom anchor point (see Fig. 1).

2. Pull up the bottom hatch and push down the bottom safety stop (see Fig. 2).

3. Climb down through the bottom hatch (see Fig. 3).

4. Attach the fall protection device to the fall protection system on the ladder.

5. Release the shock absorber from the service lift and from the ladder.



Fig.1



Fig.2



Fig.3



Fig.4

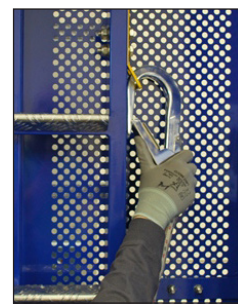


Fig.5

Evacuation through TOP hatch:

1. Attach shock absorber to the top yellow anchor point. Position yourself to one side of the bottom hatch, in the same side as the top anchor (see Fig. 6).

2. Push up the top hatch and the top safety stop (see Fig. 7).

3. Climb up through the top hatch (see Fig. 8).

4. Attach the fall protection device to the fall protection system on the ladder (see Fig. 9).

5. Release the shock absorber from the service lift and from the ladder (see Fig. 10).



Fig.6



Fig.7



Fig.8



Fig.9



Fig.10

Lift rescue procedure:

How to act in case the person travelling in the cabin becomes unconscious.

1. There is a user outside the service lift.

2. Climb up or down to the nearest control box.
3. Call the lift.

Appendix B: Inspection checklist

Date:
 Name of competent:
 Lift n°:
 Total hours of operation:
 Serial n° ladder rack:

Serial n° traction system:
 Serial n° traction system 2:
 Tower n°:
 Address of installation:

1	TRAVEL ZONE	OK	Not OK	ISSUE DESCRIPTION
1.1	Travel zone is clear of obstacles.			
2	CONTROL & SAFETY DEVICES	OK	Not OK	ISSUE DESCRIPTION
2.1	User control box is free of damage.			
2.2	User control box buttons function properly.			
2.3	The ready lamp (green) functions properly.			
2.4	UP/DOWN green lights shine when lift ascends/descends.			
2.5	All emergency stop buttons function properly.			
2.6	Bottom obstruction switch sits and functions properly.			
2.7	Top obstruction switch sits and functions properly.			
2.8	Bottom hatch switch sits and functions properly.			
2.9	Top hatch switch sits and functions properly.			
2.10	The emergency top limit switch functions properly and is properly adjusted at top and bottom platforms.			
2.11	The red fault light illuminates if a safety switch is triggered (verify with all the switches).			
2.12	The red fault light illuminates if a emergency stop button is triggered.			
2.13	The bottom/top mechanical stops are properly installed and tightened.			
2.14	The bottom/top safety position plates are properly installed and tightened.			
2.15	The roof switch functions properly.			
2.16	Anti-derailment brackets are properly installed and tightened.			
3	CABIN	OK	Not OK	ISSUE DESCRIPTION
3.1	Cabin is free of damage and properly assembled.			
3.2	Cabin is clean and in overall good condition.			
3.3	All screws assembling the cabin are mounted and tightened.			
3.4	Bottom obstruction device is free of damage, properly installed and fully functional (it compresses and decompresses properly).			
3.5	Top obstruction device is free of damage, properly installed and fully functional (it compresses and decompresses properly).			
3.6	Anchor points are free of damage (without cracks, dents and have no permanent deformation) and properly tightened.			
3.7	Steps and handles are properly placed and tightened.			
4	GUIDING SYSTEM	OK	Not OK	ISSUE DESCRIPTION
4.1	Outer surface of guiding rollers is uniform and free of damage.			
4.2	Wear of surface of guiding rollers is not be bigger than 2 mm.			
4.3	Wear of surface of counter guiding rollers is not be bigger than 1 mm.			
4.4	Guiding rollers are properly installed.			
4.5	Guiding ladder is free of damage and properly installed.			
4.6	Connecting screws between ladder sections are correctly tightened.			
4.7	Connecting screws between ladder sections and ladder rack anchorages are properly tightened.			
4.8	The rack of each ladder section is free of damage and within allowed wear limits.			
4.9	The rack is properly lubricated.			
4.10	Connecting screws between ladder rack anchorage and tower support brackets are properly tightened.			
5	DOORS AND HATCHES	OK	Not OK	ISSUE DESCRIPTION
5.1	Bottom and top hatches are fully functional (open and close properly).			
5.2	Door is properly mounted and tightened.			
5.3	Main service lift door is fully functional (opens and closes properly).			
6	ELECTRICAL SYSTEM	OK	Not OK	ISSUE DESCRIPTION
6.1	All electrical cables are free of damage (specially isolation).			
6.2	Electric cables are properly layed and fixed with necessary cable ties.			
6.3	Sealing of control boxes is in order.			
6.4	The flat travelling cable is free of damages.			
6.5	The round electrical cable is free of damages.			
6.6	The electrical plugs are correctly connected and free of damages.			

6.7	The mid tower electric cable support is properly installed and tightened.			
6.8	Bottom platform control box is free of damages.			
6.9	Mid tower junction box is free of damages.			
6.10	Top platform control box is free of damages.			
7	TRACTION SYSTEM	OK	Not OK	ISSUE DESCRIPTION
7.1	All fixing screws and bolts are present and properly tightened.			
7.2	There is no trace of oil leak around motor and gearbox.			
7.3	Motors are free of damages.			
7.4	Motors are installed and tightened onto the main structure.			
7.5	The manual descent system functions properly.			
7.6	Motors sound normal during travel.			
7.7	Motor brakes are able to stop the service lift.			
7.8	The pinions are free of damage and within allowed wear limit.			
8	OVERLOAD LIMITER	OK	Not OK	ISSUE DESCRIPTION
8.1	Perform overload test according to manual.			
8.2	Perform overload, static and dynamic tests.			
8.3	Overload limiter functions properly.			
8.4	Overload light illuminates (yellow) when the service lift is overloaded.			
9	PLATFORMS	OK	Not OK	ISSUE DESCRIPTION
9.1	Cabin passes freely through all platform openings.			
9.2	Call controls of top and bottom platform control boxes are fully functional.			
10	INFORMATION SIGNS AND DOCUMENTS	OK	Not OK	ISSUE DESCRIPTION
10.1	Verify that all information signs and documents are available and legible.			
10.2	When overlapping cabin's alignment label with ladders label, cabin is properly aligned to each of the platform floors.			
11	FINAL ASSESSMENT	OK	Not OK	ISSUE DESCRIPTION
11.1	Service lift is in overall good operational condition.			Name of competent(s) in capital letters: Signature of competent(s):



Competent inspection may only be performed by AVANTI or competent person certified by AVANTI.



Every 12 months competent inspection has to be carried out, and the Inspection checklist and Operation log sheet must be completed for possible future reference.

Appendix C: Operation log sheet

[illegible]

Appendix D: AVANTI lift anchor

D.1 Caution

AVANTI LIFT ANCHOR is an anchor point used for protection against falls from heights intended for use with a full body harness approved according to EN 361 or Z359.1:2007 as applicable. Connection to the LIFT ANCHOR is only allowed by using self-closing connectors according to EN 362 or Z359.1:2007 as applicable.

Use in connection with other equipment than specified, may be potentially dangerous. User shall be equipped with a means of limiting the maximum dynamic forces exerted on the user during the arrest of a fall to a maximum of 6kN. In case of doubt, please contact AVANTI.

The maximum load that can be transmitted in service from the anchor device to the structure is 22.2 kN in $\pm 15^\circ$ vertical direction. The maximum deflection of the anchor point that can occur in service is 10mm.

AVANTI LIFT ANCHOR is tested and approved only to be mounted on AVANTI lifts. This manual always needs to be represented in language of sale and provided for use by all technicians. Activities at height are dangerous and may lead to severe injury or even death.

Gaining an adequate apprenticeship in appropriate techniques and methods of protection is important and is your own responsibility.

Users are obliged to read and understand this User Manual. Further they need to be properly equipped and instructed with the use of the necessary fall arrest equipment and emergency procedures in case of injury or sudden illness.

Users going to install AVANTI LIFT ANCHOR need to be familiar with the installation section of this manual. It's essential to the safety, that the user always attach the energy absorber as high as possible above his/her position, to minimize the fall distance most possible in case of a fall.

The position of the anchor point is crucial for fall arrest – the height of the fall, elongation of lanyard and energy absorber or pendulum movement of the user should be considered in order to minimize the risk of impact in obstacles in case of a fall. It's prohibited for the user to do many modifications or use non original Avanti components when assembling AVANTI LIFT ANCHOR.

Re-use of demounted AVANTI LIFT ANCHORS or parts is not allowed. Any changes or other uses beyond this manual are strictly forbidden.

Any changes or other uses beyond this manual are strictly forbidden. This documentation must be kept in the service lift for the purpose of subsequent examinations of the anchor device.

D.2 Danger

The AVANTI LIFT ANCHOR is for the use of one person only. It is strictly forbidden to carry out work if the person is in unfit mental or physical condition. Climbing and working under the influence of alcohol, drugs or any medication which can interfere with the safety are also much prohibited.

If there are any doubts to the safety of the AVANTI LIFT ANCHOR, or it isn't properly fixed, deformed or damaged with cracks or similar incompatible harms it may never be used – Please contact the manufacturer immediately. In case of corrosion the anchor immediately needs to be removed.

Observations:

Only to be used by instructed workers!
Instructed workers must be aware, instructed and prepared to utilize site rescue plans.

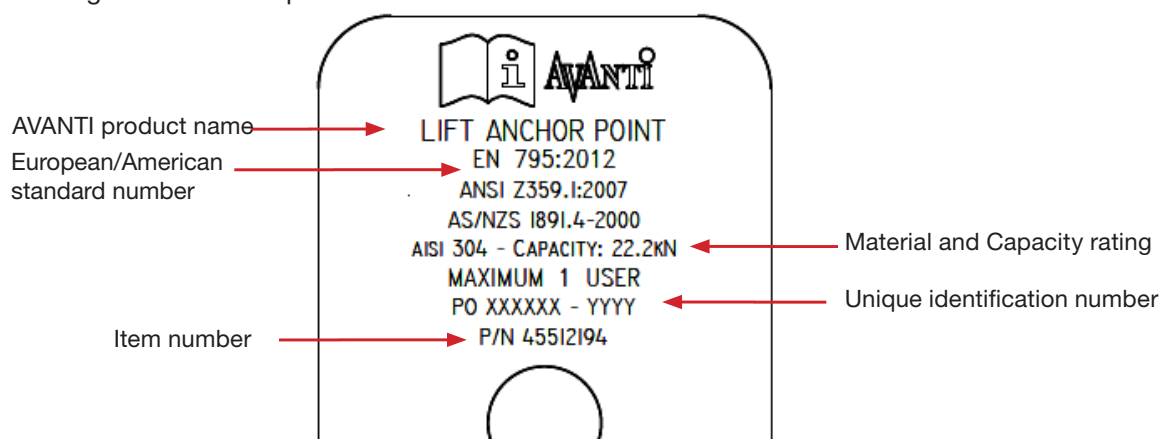
Only to be used for preventing vertical fall!

Only to be used for fall arrest, not to hoist or hang in goods or similar!
Before attaching in the ANCHOR the user needs to check it is sitting fixed and screws are sitting tight and proper.

If AVANTI LIFT ANCHOR has arrested a fall it may never be used again. Part must be removed from service immediately.

D.3 Marking

Marking on Lift Anchor plate:



After installation, marking shall be completely accessible; otherwise additional marking near the anchor device will be necessary.

D.4 Installation

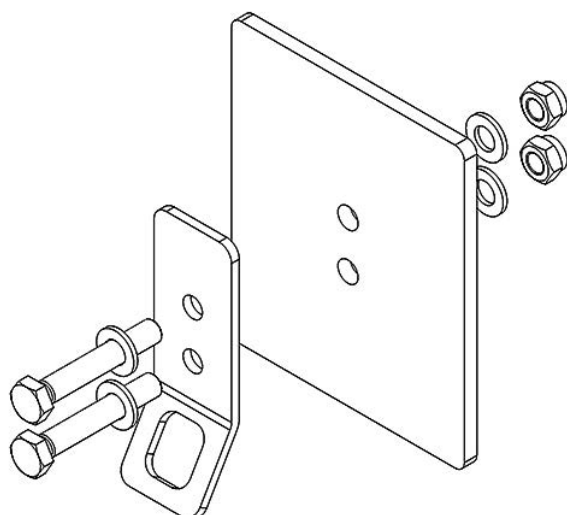
The installation must be performed by a competent person following the instructions of this manual.

AVANTI LIFT ANCHOR is tested and approved only to be installed on AVANTI lift. AVANTI LIFT ANCHOR made from AISI 304 Steel has to be screwed with two bolts DIN 933 A2-70 M12 mm, 4 washers DIN 125A A4 and self locking nuts DIN 985 A4 M12. In case of doubt, please contact AVANTI.

Before installing the AVANTI LIFT ANCHOR in heights, assure to be proper secured against fall from height by using relevant fall arrest equipment.

AVANTI LIFT ANCHOR:

1. Fix the anchor point to the structure using the supplied hardware as shown in the picture below.
2. Torque the nuts with 15 N·m (11 lb·ft).
3. Make sure the Anchor is fully seated and properly tightened.
4. Fill in "Installation form".
5. Carry out yearly inspection by following the procedure in the section "Inspection".



D.5 Inspection

After installation:

An inspection must be carried out by a competent person following the inspection form in this manual.

Before use:

Each time using the AVANTI LIFT ANCHOR the user inspects the ANCHOR visual and manually by twisting / pulling. Check the parts are properly fixed and free of deformities, damages, cracks or similar unacceptable defects.

Periodical examination:

A periodic examination at least every 12 month is essential for the safety of the AVANTI LIFT ANCHOR. The examination must be performed by a competent person following the inspection form in this manual.

For the AVANTI LIFT ANCHOR the competent person (authorized in writing by AVANTI) only needs to be trained in any metallic component covered by the European/American standard norms for fall arrest equipment.

D.6 Inspection form

PPE Anchor:	Manufacturer:	Avanti
	Type / Model:	Lift Anchor
	Identification no.:	
Fixing structure:	Lift serial no.:	
	Lift model:	
	Wind farm / WTG no.:	
Installed by:		
Installation company:		

	OK	not OK
1. Lift structure does not show any deterioration.		
2. Anchor locking screws are fully inserted and tightened with 15 N·m.		
3. Anchor does not show cracks, deformities, corrosion or other damages.		
4. Anchor installed on the lift structure according to the instructions.		
5. Anchor marking is clearly readable.		

Is the Anchor in good condition to be used?

Yes Needs Repair Replace

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Signature of competent:

Name of competent in capital letters:

Date:

If the AVANTI LIFT ANCHOR is found not OK, it must be removed / replaced by a new AVANTI LIFT ANCHOR! The result of the periodic examination must be recorded in the Registration form of anchor.

D.7 Registration form of anchor

[illegible]

